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Bulletin of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research.

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Volume 2, 1923

Edited by the Secretary of the Society, Ross C. Purdy
Assistant Editor, Emily C. Van Schoick
Assisted by Officers of the Industrial Divisions

F. H. Rhead, H. S. Kirk } Art

A. R. Payne, A. E. Williams } Glass

H. F. Staley, R. R. Danielson } Enamel

E. E. Ayars, R. F. Ferguson } Refractories

F. H. Riddle, C. C. Treischel } White Ware

A. F. Hottinger, R. L. Clare } Terra Cotta

R. B. Keplinger, A. P. Potts } Heavy Clay Products

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of the Society, Discussions of Plant Problems, Discussions
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J. S. McDowell, F. A. Harvey } Refractories
F. K. Pence, C. C. Treischel } White Wares
A. F. Hottinger, R. L. Clare } Terra Cotta
C. F. Tefft, M. B. Greenough } Heavy Clay Products

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Champion Porcelain Co., Detroit, Mich.
E. Ward Tillotson, Vice-President
Mellon Institute, Pittsburgh, Pa.
Ralph K. Hursh, Treasurer
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Norah W. Binns, Assistant Secretary
Emily C. Van Schoick, Assistant Editor
Lord Hall, O. S. U., Columbus, O.

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Mellon Institute, Pittsburgh, Pa.
B. E. Salisbury
Onondaga Pottery Co., Syracuse, N. Y.

Vol. 2 February, 1923 Nos. 1 and 2

EDITORIAL

WHAT SERVICE SHOULD BE RENDERED BY THE AMERICAN CERAMIC SOCIETY IN 1923

When the American Ceramic Society engaged a secretary for full-time service it was done that the Society could more effectively serve the Ceramic Industries. Only a limited number of the proposed lines of activities could be followed through as fully as had been planned, but with the larger experience and with the more efficient organization a larger service in 1923 is not only possible, but is essential.

The three new Divisions: Art, Heavy Clay Products and Whitewares, are now well under way with definite purposes and well-working organizations.

The *Journal* has been enlarged, the world's literature abstracted more thoroughly and more discussions of papers and topics developed, and the *Bulletin* instituted. Some of our friends have been so kind as to tell us that the *Journal* is a live, inspiring report of research activities.

The Divisions, the Local Sections, the Committees, the Board of Trustees and the *Journal*, it seems to us, should be the means to the ends for which the Society was organized and chartered: To promote the ceramic arts and sciences.

How can the ceramic arts and sciences be most effectively promoted? This is the query in answer to which we shall direct our efforts during this year.

Mr. A. V. Bleininger outlined a program of activities in September, 1921, which seems to us to be well worth adopting for 1923. If those to whom his recommendation makes an appeal will collaborate with the executives and committees there is no reason why a considerable portion, if not all of this program, can not be realized.

1. The work of certain committees should be pushed very vigorously immediately. I am referring particularly to the Committee on Standards. No more important work could be undertaken than the standardization, through specifications, of the principal raw materials, such as flint, feldspar, ball clays, sagger clays, etc. Certain misconceptions as to the functions of these materials cause a continuous loss which could be readily stopped. A modern classification of clays, based entirely upon their physical properties, is urgently needed.

2. Steps should be taken also to compile the information already available for use. A large amount of data is scattered through our *Transactions* and various *Journals* which should be brought together in the form of a handbook, like the "Sprechsaal Kalender," but much larger, more complete and better all around. The book might be divided into two parts, one dealing with general information and the other with specific industries. The former could be prepared by assigning different subjects to men well qualified to handle them. The industrial topics could be turned over to the Divisions who would be best qualified to include the material most valuable and to arrange it in the best manner.

3. Research organization is desirable. The only point is that we must not overdo this kind of work. The industries have never yet failed to produce any kind of a product, which may be needed in any quantity, quite different from some of the purely chemical industries and the need for research is not as acute as it is with them.

4. The great need of the industries is for trade schools, in which the young clay workers of the country may be trained for their work and for advancement. As it is, the thousands of young men engaged in factory work have no opportunities, and the places to which they aspire are taken by college trained men having no previous connection with the industries. The need is imperative for schools like those at Stoke-on-Trent, Sèvres, Bunzlau, Hoehr, Teplitz, etc., where through afternoon and evening classes the young men are given an opportunity to really learn the fundamentals of their trade, which is not done in the present status of the apprentice system, and in addition be given the technical principles of the manufacturing processes. This could be worked out in several of the leading ceramic centers in connection with the High Schools, supplemented by workshops and laboratories made available through coöperation on the part of the manufacturers. There is no reason whatever why one or two such schools, in addition to the one at Trenton, could not be established, and the SOCIETY could do no better work than to lend its influence towards this end. The trade schools of Germany have played an important part in the industrial development of that country

and we also can no longer neglect our industrial population. It must be given opportunities not only from the standpoint of industrial training, but also from that of citizenship and higher aspirations. We must do our part to help raise our people from the deadly mediocre level to a higher one.

5. The preceding paragraph is not intended in any way to prejudice the cause of collegiate education in this field. But with the development of trade schools, the level of accomplishment on the part of the college trained man must undoubtedly be raised. The need along these lines is not number of graduates but quality of training, and even now it would seem that the four years' course is hardly adequate, and it might become necessary to insist upon a five years' course or one of four years with summer studies. The danger of overcrowding the field with a large number of indifferently trained graduates is very real, and we should not encourage the example set by the colleges as regards technical training in general. The country has been flooded with poorly trained men for whom there are not sufficient places in normal times. We are not desirous to create a technical proletariat.

I believe it would be well if the Society gave some attention to ceramic education and could counsel the schools in connection with the general problem and such details as might come up for consideration.

PAPERS AND DISCUSSIONS

DISCUSSION ON "THE RELATIVE MERIT OF HEAT RESISTING ALLOYS FOR ENAMEL BURNING RACK"[1]

By I. F. Cox:—The data presented by Mr. Poste are of particular interest, not only from the standpoint of the user of enameled products, but of all furnace users, as metals play an important part in the construction of most furnaces.

The composition of the furnace atmosphere, the fuel used in firing, and other furnace conditions will have a considerable effect on the degree of oxidation of metal parts. This is of course a function also of temperature, and this temperature would have to be known quite accurately to obtain any strictly comparable results. For instance, in the matter of calorized steel, we recommend it only for intermittent service above 1700°F, for continous service at or below that temperature. Experience in a variety of applications has indicated that the dead line is perhaps sharper than one would think.

In connection with the place occupied by calorized steel in this list, it would be of interest to know the kind of steel to which the calorizing had been applied, and whether this was effected by the dipping or powder process. Judging from the data in Table I, it is probably a piece of rolled steel, as a piece of calorized steel will have a slightly higher resistance to warpage (as measured by this test) than the same piece of steel uncalorized. A piece of cast steel, calorized, would occupy a higher position in Table I, and the same position it now occupies in Table II.

The accurate determination of the relative resisting power of various metals is very difficult to determine from laboratory data, principally because it is quite difficult to exactly reproduce the commercial conditions under which these metals are to be used. The "order of magnitude" can so be determined, and thus an indication given of what metals are worth trying out on a commercial scale. Where possible, it is highly desirable to subject several sets of the test pieces to commercial conditions. On the basis of results obtained from such a test, or from laboratory tests, the next logical step is the trial of one or two commercial sized pieces under operating conditions, of these alloys which look most promising. It is interesting to note that two alloys mentioned in Mr. Manson's discussion of Mr. Poste's paper, occupy a different relative position at 2000°F, than they do in Mr. Poste's experiments at 1700°F. This indicates further, the desirability of subjecting the test to actual commercial conditions, wherever possible.

Mr. Poste has well pointed out the necessity of considering the various conditions to be met—the relative importance of warpage, oxidation, etc., and the consideration of the whole matter on the basis of relative

[1] *Jour. Amer. Ceram. Soc.*, 5 [11], 811 (1922).

cost. In figuring costs on this basis, there must often be taken into consideration the matter of cost of replacing and lost production during the time required for replacement.

CALORIZING CO.
PITTSBURGH, PA.

NOTE ON "THE DISINTEGRATION OF SODA LIME GLASS IN WATER"

BY J. C. WITT:—In a paper on the above subject by Arthur E. Williams[1] it is stated that when soda lime glass has been treated in water at temperatures below boiling, at boiling point, and up to 25 pounds pressure in an autoclave, disintegration results—*i. e.*, cracks, spalls and loss in weight. This is a very interesting paper and reminds me of some failure of glass fruit jars in this laboratory.

We have not been carrying on any research on glass, but in connection with some of our work we have filled glass fruit jars with water or solutions, covered the top with a rubber membrane and then placed them in water in a larger cylinder where they were subjected to a hydrostatic pressure of 500 pounds per square inch for periods ranging from several days to several months.

None of these jars broke in service, nor did they break immediately after removing from the pressure cylinder. However, it has been observed that a number of these jars have cracked several weeks after the pressure treatment. In the first instances it was taken for granted that the jars had been cracked as a result of moving them around the laboratory but so many cases have been observed that it is now known that this is not the case.

In the light of the paper by Mr. Williams, it seems that the glass may have been attacked to some extent by the water under pressure, although they were not subjected to anything above room temperature. A possible explanation is that they were weakened by this treatment, then at some later time became cracked due to slight changes of temperature in the laboratory.

REPLY BY A. E. WILLIAMS:—The occurrence noted by Mr. Witt regarding the spontaneous breakage of glass articles has come to my attention a number of times. This has especially been noted with large vessels used for show purposes or for the storage of organic specimens, which have given way spontaneously after a year or more of standing filled with liquids, usually alcohol or salt solution. The more resistant soda-lime glass now generally made would probably never exhibit any such breakage, the cause of which may possibly be explained as a release of stresses in the surface film, due to solution lowering the tensile strength of the article as a whole.

[1] *Jour. Amer. Ceram. Soc.*, **5** [8], 504–17 (1922).

PRESIDENT'S PAGE

DR. ORTON TO INDUCT 1923 OFFICERS INTO OFFICE

All of the older members of the SOCIETY who have attended any of the earlier conventions will remember how Dr. Orton introduced the new officers to the members. Everybody felt that it was a privilege to be there and the officers themselves felt that the honors they were receiving were even greater than they had previously considered them to be. After the officers had been installed, the group of two or three who had been selected to be promoted to active membership were formally presented to the SOCIETY and made to feel that the promotion was not only an honor but that they deserved this recognition as a compensation for the loyalty they had shown the SOCIETY as well as for their contributions.

It is a pleasure to announce that Dr. Orton has written accepting our invitation to induct the 1923 officers into office at the banquet at the annual meeting in Pittsburgh.

We deem it an honor to have him with us at our Silver Jubilee Meeting and are sure that his presence will be of interest and so appreciated by the older members that they will arrange to attend the meeting.

REPRESENTATION OF DIVISIONS ON THE BOARD

The November *Bulletin* announced a proposed amendment to the Constitution[1] which was introduced at the meeting held at the Chemical Exposition by Messrs. Staley, Sweely and eight other members. This amendment was later withdrawn with the understanding that it would again be brought up by the Rules Committee after some alterations had been made in the methods of election and terms of office of the various members.

The important point about the amendment is that it provides that the Board of Trustees will include as a member a trustee from each Division, each trustee to be chosen by the particular division which he represents. This is a step towards decentralized control and should receive the hearty support of all. The present method of having three trustees besides the officers and two past presidents, and having these men chosen at random regardless of division connections, has worked well in the past but is not adequate for our present needs.

The three most important points to consider in the procedure for the accomplishment of this are the method of election by the division members, the term of office, and the schedule for the year of installation of trustees from each Division, so that the entire board will not go out of office at once. This provision for an overlapping of terms of office of the various trustees is the most important point to consider. It is hoped that the Rules Committee will be in position to present the proposed amendments at the February meeting and that they will receive everybody's hearty support.

[1] *Bull. Am. Ceram. Soc.*, **1** [11], 321(1922).

ACTIVITIES OF THE SOCIETY

OH, SHOOT!

Whether the season's sport is rabbit hunting or African golf, the record of the past two months is not to be sneezed at by those who have been taking a rest since the football team disbanded. Evidently a law has been passed prohibiting the bagging of more than one Corporation Member by an individual, and in eight weeks we have only five to show, but the smaller game has been plentiful and fifty-two specimens are ranged in the Secretary's office. W. E. Lemley has proved himself an all-round sportsman and heads the list. Ira Sproat reached up a little way into the sky and pulled down a big bird with one hand and a little one with the other. W. E. Dornbach and M. Ichiyo each came in with two, and thirty-six hunters have one apiece. C. L. Sebring, Geo. S. Tillotson, and A. Weber, Jr., are responsible for the big game. The score card follows:

	Personal	Corporation		Personal	Corporation
W. E. Lemley	4		F. A. Kirkpatrick	1	
Ira E. Sproat	1	1	J. H. Krusen	1	
W. E. Dornbach	2		R. D. Landrum	1	
M. Ichiyo	2		A. Malinovszky	1	
C. L. Sebring		1	C. R. Minton	1	
Geo. S. Tillotson		1	F. K. Pence	1	
A. Weber, Jr.		1	F. H. Rhead	1	
L. R. W. Allison	1		Will A. Rhodes	1	
F. H. Auld	1		R. F. Segsworth	1	
C. E. Bales	1		Mary G. Sheere	1	
L. E. Barringer	1		C. Saxton	1	
G. H. Brown	1		A. Silverman	1	
Lawrence H. Brown	1		Harry F. Spier	1	
B. M. Burchfiel	1		W. E. S. Turner	1	
R. R. Danielson	1		K. E. Ward	1	
M. S. Gifford	1		R. V. Widemann	1	
R. B. Gilmore	1		W. J. Watkins	1	
Herbert Goodwin	1		W. W. Wilkins	1	
Chas. O. Grafton	1		W. S. Williams	1	
R. K. Hursh	1		Hewitt Wilson	1	
S. M. Kier	1		Office	8	1
R. M. King	1				
			Total	52	5

The net increase for 1922 is:

	Personal	Corporation
Jan. 12, 1923	1611	216
Jan. 1, 1922	1350	139
	261	77

The gross increase by periods since December 1921 is as follows:

	Personal	Corporation	Total
December to February, 1922	68	5	73
February to May	81	10	91
May	13	13	26

	Personal	Corporation	Total
June	13	5	18
July	25	11	36
August	20	5	25
September	31	11	42
October	31	12	43
November	25	7	32
December to January 12, 1923	52	5	57
Total	359	84	443
Loss	98	7	105
Total	261	77	338

NEW MEMBERS RECEIVED FROM NOVEMBER 16, 1922, TO JANUARY 12, 1923

ASSOCIATE

Anderson, Edward, 206 Grosvenor Ave., Dayton, O., Superintendent, The A. A. Simonds-Dayton Co., Dayton, O.

Barkby, Harry, Decorating Manager, Chelsea China Co., New Cumberland, W. Va.

Botfield, Leonard B., 776 S. Swanson St., Philadelphia, Pa., Botfield Refractories Co.

Byrnes, A. Marietta, 63 Audubon Place, New Orleans, La.

Compton, Max D., 232 W. 42nd Place, Los Angeles, Calif., Ceramic Engineer, Los Angeles Pressed Brick Co.

Conaway, W. P., Production Manager and General Superintendent, Western Pottery Co., Denver, Colo.

Conover, Norman, Denny-Renton Clay & Coal Co., Taylor, Wash.

Corson, Kenneth P., 115 County-City Bldg., Seattle, Wash.

De Celle, Joseph A., 625 N. Genesee, Waukegan, Ill.

Didisheim, Frank Marcel, 234 Union St., Schenectady, N. Y. General Electric Co., Schenectady, N. Y.

Early, Joseph N., 240–246 Huron St., Brooklyn, N. Y.

Fessler, A. H., Asst. Cer. Engr., U. S. Bureau of Mines, Columbus, O.

Gerber, Albert C., Cer. Engr., John L. Mott Co., Trenton, N. J.

Goodwin, James Rushworth, 1267 Kenilworth Ave., Coshocton, O., Assistant to Factory Manager.

Graham, Charles E., 156 Hope St., Huntington Park, Calif., Asst. Chemist, Washington Iron Works.

Harrison, Wm. Nance, 4319 Iowa Ave., N. W., Washington, D. C., Laboratory Assistant, Bureau of Standards.

Hathaway, G. Frank, Genl. Supt., Wyman-Gordon Co., Worcester, Mass.

Homer, Marion, 368 Ashland Ave., Riverforest, Ill., Instructor of Art, McKinley High School.

Hull, Addis E., Jr., 1252 Euclid Ave., Zanesville, O., Assistant to Gen. Mgr., A. E. Hull Pottery Co., Crooksville, O.

Ikeda, Sertio, Nippon-Beer-Kosen-Kaisha, Amagasaki near Osaka, Japan.

Kamikawa, Michiro, Nippon-Beer-Kosen-Kaisha, Amagasaki near Osaka, Japan.

Kingsley, Charles B., Elizabeth, Pa., Asst. Mgr., Mississippi Glass Co., Floreffe, Pa.

Kreutzer, Walter E., 4640 Cliff Ave., Louisville, Ky., Foreman, Louisville Fire Brick Works.

Leahy, Arthur T., 5490 Ellis Ave., Chicago, Ill., Mgr., Plastic Dept., A. P. Green Fire Brick Co.

Lemmax, Wm. W., Box 59, Taylor, Wash., Chief Engineer, Denny-Renton Clay & Coal Co.,

Ligon, W. A., Box 246, Mayfield, Ky.

McConnell, Oscar F., Box 65, Taylor, Wash.

McVay, Thos. N., Instructor Ceramic Dept., University of Illinois, Urbana, Ill.

Middleton, G. Gregg, 7 Highland Grove, Worksop Notts, England, Works Manager, Selands Glass Works.

Miller, Robert V., Y. M. C. A., E. Liverpool, O., Ceramic Engineer, Knowles, Taylor & Knowles Co.

Mize, W. E., 514 Bangor Bldg., Cleveland, O., Ohio representative, Golding-Keene Feldspar Co.

Norton, Charles L., Professor of Physics, Mass. Inst. of Technology, Cambridge, Mass.

O'Brien, Thomas H., 27 Mathewson St., Providence, R. I.

Plank, Ross D., 532 La Salle Ave., Culver City, Calif., Glaze Chemist, Los Angeles Pressed Brick Co.

Poste, James, Denny-Renton Clay and Coal Co., Taylor, Wash.

Prentice, Ernest B., Box 513, Massillon, O., Vice Pres. and Secy., Massillon Refractories Co.

Pressler, E. E., 1835 Indianola Ave., Columbus, O., Laboratory Assistant, U. S. Bureau of Mines.

Riviere, Georges, 98, Boulevard de Courcelles, Paris, Ingenieur des Arts et Manufactures, Administrateur-Directeur de la Cie Gle de Construction de Fours.

Scalise, Antonio, Columbia Glass Co., Fairmont, W. Va.

Sloan, Burrow, 117 South 16th St., Philadelphia, Pa., Vice Pres., General Refractories Co.

Smart, Richard Addison, 114 Colorado Ave., Detroit, Mich., Detroit representative, American Refractories Co.

Smith, Ralph Ogden, 19 Chestnut St., Salem, N. J., Chemist, Salem Glass Works.

Tapper, E. H., 58 Holcomb St., Charlotte Station, Rochester, N. Y.

Taylor, Albert C., Woodworth Hotel, Robinson, Ill., Asst. Engr., W. A. Dase & Son Mfg. Co., Buffalo, N. Y.

Vernon, Cecil, 182 Shaftesbury Ave., Thorpe Bay, Essex, England, Engineer, Newalls Insulation Co.

Webb, R. S., Chemist, American Window Glass Co., Belle Vernon, Pa.

Weeden, Charles H., 1295 N. 4th St., Columbus, O.

Wehtje, Ernst, Bromölla, Sweden, Managing Director, Aktiebolaget Ifö Chamotte & Kaolinverk.

Wescott, Ernest Waters, c/o Niagara Alkali Co., Niagara Falls, N. Y., Research Engr., Kalmus, Comstock & Wescott.

Whitesell, Buhel E., Salina, Pa., Cer. Engr., Kier Fire Brick Co., Pittsburgh, Pa.

Wilson, Louis A., Chf. of Testing Dept., New Jersey Zinc Co., Palmerton, Pa.

Wormer, Grace, University Library, Iowa City, Iowa, Acting Librarian.

Corporation

All-in-One Plumbing Fixture Corp., 231 Ochsner Bldg., Sacramento, Calif.

Crescent China Co., Alliance, Ohio.

Sterling Grinding Wheel Co., Tiffin, O.

Vanderbilt, R. T. Co., 50 East 42nd St., New York City.

Weber Electric Co., Schenectady, N. Y.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY?

Frederick M. Becket of the Union Carbide Company, Niagara Falls, N. Y., is now located at 30 E. 42nd Street, New York, N. Y.

Edward R. Beidler, formerly of Toronto, Ont., Can., has moved to 356 E. National Ave., Brazil, Ind.

William J. Benner has notified the office of a change of address in Chicago from 6338 Wayne Ave., to 1409 Rosemont, Edgewater Station.

Leonard S. Briggs, of Lenox Inc., can be reached by addressing mail to Box 694, Trenton, N. J.

Wilson C. Broga formerly of Worcester, Mass., is now living in Greenfield, Mass.

Orello S. Buckner has moved from Holden, Mass., to 13 Charles St., Westboro, Mass.

John Lister Carruthers has severed his connection with The Denver Terra Cotta Co., and is now located at 66 S. 3rd St., Columbus, O.

Champion Ignition Company, Flint, Mich., is to be addressed in future as the A C Spark Plug Company.

Charles R. Fettke has changed his address from Carnegie Institute of Technology to 1118 Wightman St., Pittsburgh, Pa.

J. Parker B. Fiske has notified our office that his new address is 839 Beacon St., Boston, Mass.

Charles E. Golding of Golding Sons Co., has moved from 3rd & Hanover St., to 31 Columbia Ave., Trenton N. J.

Herbert Goodwin of the Crescent China Co., has been transferred from Niles, O., to Alliance O.

John S. Grainer has severed his connection with the Challenge Refrigerator Co., Grand Haven, Mich., to accept a position with the Estate Stove Co., his present address being 706 W. Main St., Hamilton, Ohio.

Maurice B. Greenough, formerly of Cleveland, O., is now located at 801 Volunteer Bldg., Chattanooga, Tenn.

Fred T. Heath of The Heath Unit Tile Co., informs this office that the firm is now located in the Puget Sound Bank Bldg., Tacoma, Wash.

J. W. Hepplewhite is now with the Johns Manville, Inc., Manville, N. J.

Interstate Corporation has been changed to The Bowman Coal Co., Broad Street Bank Bldg., Trenton, N. J.

Walter A. King of the Elyria Enameled Products Co., has changed his residence to 149 Branston, Elyria, O.

F. A. Kirkpatrick of Unionville, Mich., advises us that his new address is 1001 W. Pine St., Robinson, Ill.

George J. Lawrence, formerly of Chicago is now with the J. B. Ford Co., Wyandotte, Michigan.

P. William Lee writes that he is now with the Denver Terra Cotta Company at Denver, Colo.

Wm. R. Malkin informs us that he has taken a position with the B. F. Drakenfeld Co., Inc. at East Liverpool, O.

Frederic Merian has removed from 3415 Iowa street, Pittsburgh, to 815 St. James Street.

L. M. Merrit is now living at 481 Lexington Ave., Columbus, O.

Julius A. Miller who has been conducting work at Mellon Institute for H. Koppers Co., informs us that he has taken a position with Nesbit and Bollen, 403 Liberty Ave., Pittsburgh, Pa.

G. Z. Minton, of Kokomo, Ind., is now living at Elwood, Ind.

W. O. Mitcherling has asked that his address be changed from Landing, N. J., to Wilmington, Del.

Amos Potts recently of the Clay Products Co., Brazil, Ind., is now living at 47 N. 20th St., Columbus, O.

Prof. L. M. Richard is now living in Ocean Park, Cal., 2614 4th Street.

Edward J. Risch has notified us to change his address to 1534 Massosvoit Ave., Chicago, Illinois.

V. J. Roehm who has been with the Homer Laughlin China Company of Newell, W. Va., is now with Sec. 1, Division 9, Bureau of Standards, Washington, D. C.

E. M. Rupp, formerly of Keyport, N. J., is now in Middletown, O., 714 Lincoln Ave.

Harry W. Smith who has been living in Cleveland, O., writes that his address is 307 Fulton Bldg., Pittsburgh, Pa.

Peter Wachovec has notified us that he has moved to 9620 Park Heights Ave., Cleveland, O.

R. H. White has left Norton Company at Niagara Falls, N. Y. and is situated with the Abrasive Company of Canada, Ltd., Burlington St., Hamilton, Ont.

Richard P. White has returned from Hamilton, Ont. and is living at 121 S. Menard Ave., Chicago, Ill.

Y. Y. Wong has returned to Canton, China from Los Angeles, and is working with the Chen Kwong Co., Sap Pat Po.

REPORT OF CHICAGO LOCAL SECTION MEETING

On Dec. 2, 1922, the Chicago Section AMERICAN CERAMIC SOCIETY held at the Morrison Hotel, Chicago, the annual meeting which broke all standing records for attendance and interest. Sixty-five gathered around the banquet boards, which is more than double the second best number. We are not sure but that this sets a new record for any Sectional meeting not held in conjunction with any other organization. At any rate, the Executive Committee feels justly proud of the result of their efforts. Possibly the fact that a beautiful wired vase was given away (product of W. W. Wilkins, Lewis Institute) helped swell the crowd, as this was a "wonderful opportunity for somebody" to get a nice Christmas present for friend wife without paying for it. Mr. C. A. Underwood of the American Refractories Company, Joliet, was the lucky man. We heard someone near us remark that giving a lamp without a shade was like giving a set of books and paying the first installment, but we trust Mr. Underwood does not look at it in that light.

The program was sufficiently rich in material to be of interest to everyone present no matter with what branch of the industry he may have been allied. B. T. Sweely, of the Cribben-Sexton Stove Works, talked on "Defective Enamels," which, to the many enamel men present, held much food for thought. Mr. Sweely is very well qualified to talk on this subject for two reasons: the first being that he spent several months on special investigation work at the Bureau of Standards, Washington, and second, to use his own words, because he has made more defective enamels than any one else in the country.

We were very much pleased to have on our list of speakers Mr. E. O. Herman of the A. D. Little Co., Ind. Engineers, Boston, Mass., whose talk on the "Technical Man's Position in Production" held everyone's interest for more than half an hour. No one can listen to Mr. Herman without feeling some of his tremendous enthusiasm.

"Something Better in Enamel Smelters" by H. E. Davis, Northwestern Terra Cotta Company was a description of a furnace designed and built along principles adapted

for the most part from the Steel Industry in order to give the greatest possible efficiency to this process. The combustion chamber for the oil flame, the arch over the bath, and the insulation are the salient features of the furnace

Of greatest importance to the Chicago Section and the Ceramic Industries of this part of the country is the "Proposed Introduction of a Course in Ceramics in The New Crane Junior College of Chicago." Mr. Meyer, Assistant Principal of the school left his sick-bed to talk to us on this proposition, for the success of which he is putting forth every effort, and asking for our whole-hearted support. A committee has been appointed to coöperate with Mr. Meyer and he may rest assured that we are "with him" on anything so fine and worthy.

After the reading and discussion of the papers, the Annual Election of Officers was held, and the following were elected:

B. T. Sweeley	Pres.
W. W. Wilkins	Vice-Pres.
H. E. Davis	Sec'y. & Treas.
D. F. Albery	Ch'm. Prog. Comm.
Alan S. Wikoff	Ch'm. Memb. Comm.

Having seen what can be done to make a real live Local Section, the new officers are determined to uphold the reputation.

Respectfully submitted,

H. E. Davis, *Secretary*

MEETING OF THE PITTSBURGH DISTRICT SECTION OF THE AMERICAN CERAMIC SOCIETY

A meeting of the Pittsburgh District Section of the American Ceramic Society was held in the Fellow's Room of the Mellon Institute, Pittsburgh, Pa., on December 2, 1922, at 3: 00 p.m. with Mr. A. F. Greaves-Walker, the retiring chairman, and Dr. Alexander Silverman, the newly elected chairman, presiding.

The committee on nominations, submitted their report and on motion duly seconded the following officers were elected for the coming year:

Chairman	Alexander Silverman
Vice-Chairman	Francis C. Flint
Secretary	H. G. Schurecht
Treasurer	Thos. H. Sant
Councillor	Francis W. Walker, Sr.

The following reports of the committees were made:

Publicity

Dr. Tillotson reported for this Committee, that four or five feature stories regarding the meeting and abstracts of some of the papers will be printed in the newspaper.

Mr. Greaves-Walker, Jr., suggested that one man act as a publicity man to take the events of each day and present them to the newspaper. *The Clay Worker* also expressed their willingness to publish notices regarding the convention.

Mr. Greaves-Walker, Sr., suggested that all publicity reports be put in writing for publication.

Dr. Silverman suggested putting announcements in some of the moving picture theatres.

Service Committee

H. G. Schurecht reported that plans were being made whereby each division will know what papers are being presented in the other divisions.

SMOKERETTE COMMITTEE

It was decided to hold the smokerette on Tuesday night instead of Wednesday which date will be used for the Alumni party.

BANQUET COMMITTEE

Dr. Silverman stated that this would start promptly at 7:00 P.M. Speakers will be provided, honor guests will be heard from and souvenirs will be presented. A registration fee of $7.50 will be charged which will take care of the banquet smoker and entertainment of the ladies. Those members living in Pittsburgh will pay $10.00

ENTERTAINMENT OF LADIES

Mr. Greaves-Walker reported that the ladies will hold a reception and tea in room adjoining the general assembly room of the William Penn at 4 to 5 P.M., Monday. They will have a luncheon Tuesday noon at Heinzes. On Wednesday, a luncheon and Theatre Party will be held.

Ross suggested that a playette be given by the students in drama of Carnegie Tech.

TRIPS COMMITTEE

Mr. McDowell reported that four trips will be taken on Thurdsay and three on Friday. On Thursday one group will go to Beaver Falls escorted by F. W. Walker. A city trip to The Standard Sanitary Manufacturing Company, Pittsburgh Clay Pot Company and The Heinz Bottle Factory will be made. The third trip on Thursday will be to the glass plant at Creighton, Pa. The fourth will be to The By-Products Coke Works, Clairton, Pa.

On Friday one trip will be made through the Carnegie Steel Company, Homestead.

Another trip will be taken to the By-Products Coke Oven Plant, Hazleton, The Westinghouse Electric Company, and the National Tube Company.

A third trip on Friday will be taken to Washington, Pa., as trip to East Liverpool was cancelled because of the potter's strike.

Respectfully submitted,

H. G. SCHURECHT, *Secretary*

NOTES AND NEWS

CALENDAR OF CONVENTIONS

American Association of Flint and Lime Glass Mfrs.—April, 1923.
American Association of Ice & Refrigeration—Washington, D. C., Probably March, 1923.
AMERICAN CERAMIC SOCIETY—Pittsburgh, Pa., February 12–16, 1923.
American Dental Trade Association—Spring Lake, N. J., June, 1923.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association, Southern Group—West Baden, Ind., November, 1923.
American Foundrymen's Association—Cleveland, Ohio, April 30–May 3, 1923.
American Gas Association—October, 1923.
American Hotel Association of United States and Canada—San Francisco, April, 1923.
American Institute of Mining and Metallurgical Engineers—New York City, February, 19–22, 1923.
American Society for Testing Materials—Place not determined, June, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.

Association of Scientific Apparatus Makers of the United States of America—Washington, D. C., April 20, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products Association—Chicago, Ill., Third Tuesday in each month.
Common Brick Manufacturers' Association—Cleveland, Ohio, February 5, 6 and 7, 1923.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
International Chamber of Commerce—Rome, Italy, Week of March 19, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Brass Manufacturers, March, 1923.
National Association of Manufacturers of Pressed and Blown Glassware, Pittsburgh, March 13, 1923.
National Association of Manufacturers of the United States—New York City, Week of May 14, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glasss Manufacturers—Place and date not determined.
National Association Builders Board of Control—Des Moines, Ia., February, 1923.
National Board of Fire Underwriters—New York, May 24, 1923.
National Bottle Manufacturers' Association—Atlantic City, N. J., Last of April, 1923.
National Brick Manufacturers' Association—Cleveland, Ohio, February 5–10, 1923.
National Clay Machinery Association—Cleveland, Ohio, February 7 and 8, 1923.
National Gas Appliance Manufacturers' Exchange—Kansas City, Mo., May, 1923.
National Gas Association of America—Louisville, Ky., Spring, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
National Gas Association of America—Louisville, Ky., April 23–24, 1923.
Refractories Manufacturers' Association—March 21, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Southern Association of Stove Manufacturers—Louisville, Ky., March, 1923 (?).
Stoker Manufacturers' Association—May or June, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

F. H. Rhead, H. S. Kirk — Art
H. F. Staley, R. R. Danielson — Enamel
A. R. Payne, A. E. Williams, E. E. Ayars, F. A. Harvey, F. H. Riddle, C. C. Treischel — Glass, Refractories, White Wares
A. F. Hottinger, R. L. Clare, R. B. Keplinger, A. P. Potts — Terra Cotta, Heavy Clay Products

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Vol. 2 March, 1923 No. 3

EDITORIALS

OUR SILVER JUBILEE

Industrial ceramics has had twenty-five years of unselfish promotion of art and science; first by the ten men who originated the idea of a Society for this purpose, then by the twenty-one men who were the charter members and lastly by the nineteen hundred members of the American Ceramic Society. A quarter of a century has passed since the original ten met in Pittsburgh to discuss the advisability of organizing a coöperative means of obtaining and disseminating data and information on technical and scientific ceramic problems. Five of the original ten men met in Pittsburgh on the twelfth of last February with five hundred other ceramists to celebrate the twenty-fifth anniversary of that first council of ten, and to consider the technical and scientific problems of the present day ceramic manufacturing.

A visualization of the present day larger appreciation by manufacturers of the service rendered by the American Ceramic Society may be had from the fact that four years ago the entire Convention was held in the room which this year the Whitewares Division alone crowded. Four years ago the Divisions were not organized; this year seven Divisions held two sessions on each of the two days with programs that totaled 190 original contributions, several committee reports, discussions and questions.

The large attendance, the excellence of the entertainment by the Pittsburgh Section and particularly the large amount of valuable information developed by the "seven conventions in one" fittingly honored that meeting of the original ten men of twenty-five years ago. The rapidly increasing attendance at these Conventions is evidence that organized coöperation in the creation and dissemination of technical and scientific ceramic knowledge is of increasing value to ceramic manufacturing.

TECHNICAL INVESTIGATION AND RESEARCH BY TRADE ASSOCIATIONS

Associations of manufacturers of like products are organized primarily for collective search for the most economical tariff, traffic, labor, manufacturing and management terms and means. In this they are coöperating directly with such of the public as are interested and with the federal and state authorities representing the public at large. Trade associations in America have increased in numbers until now there are several hundred whereas twenty-five years ago there were only a few. Trade associations are recognized as essential to the economic welfare not only in this country but also in all countries where manufacturing is carried on to any extent.

Manufacturers in America have had many years' experience with legal restraints and it should be expected that price fixing and other practices unfair to the public should continue to be subject to rigid restraint. The limiting laws of today, however, are not in harmony with the need of cooperation in business. The Sherman Act was directed against consolidations of capital at a time when collective action through trade associations was not a factor either in manufacturing or business. Consolidation of capital that eliminates competition is a vastly different thing from collective action through trade associations. The former is often (although not always) without regard to public welfare whereas trade association activities have been most largely of direct benefit to the general public. Consolidation of capital gives domination in business; collective activity through trade associations develops individualism, improves business standards and eliminates waste in production and distribution. Trade associations are the essential contact agents for government bureaus, and the effectiveness of government bureaus in their aid to manufacturers has increased with the increase in strength of the trade associations. Coöperative investigations supported by producers, consumers and the public are possible only when the producers and consumers each are organized.

It is true that evil practices are possible with trade associations. Any collective activity can be used for conspiracy against public interests and trade associations are no exception.

Among the most beneficial activities of trade associations are those that will improve quality of product, stabilize labor relations, and reduce cost of manufacturing. Technical investigations, standardization of materials and products, and elimination of wastes are the means by which trade associations obtain these results.

The AMERICAN CERAMIC SOCIETY through its officers and committees is pledged to promote investigations by trade associations in coöperation with such research organizations as federal bureaus, Mellon Institute and the commercial laboratories. Coöperative investigation by trade associations brings the needs and the benefits directly to managing employers; insures engagement on the most essential and vital problems; stages the investigation on plant conditions and takes recognition of the viewpoints of the supporting firm members, thus making the data, observations and conclusions of immediate and direct benefit and value. This short cut contact between the several plants and the central laboratory with its broadening influence alike on the plant operators and the investigators can be had in no other way than through trade associations. It clears away the secrets in manufacturing which have made the application of results of research so slow in the past. It makes possible a study of problems on a large scale in an authoritative manner, establishing more economical production practices. When an association of users will collaborate with an association of producers on a problem, ware of the required quality will be produced and marketed to the advantage of both parties and to the public at large.

The function of the AMERICAN CERAMIC SOCIETY in this scheme of cooperation affects in no wise this direct contact between the association of producers and the research laboratories. There is a need for the AMERICAN CERAMIC SOCIETY devoted as it is exclusively to the promoting of research agencies and activities, gleaning all the information extant from the world's literature, making and preserving records of research, data and observations and in every other possible way not only building up a fund of information regarding materials, processes and products but also promoting the means of obtaining this information. The practical value in the work of the AMERICAN CERAMIC SOCIETY lies in the fact that it represents all ceramic industries and therefore brings to each all of value that has been obtained by the others. All ceramic manufacturing has many things of common interest. It may seem to be a "long cry" from the manufacture of glass or enameled ware to the manufacture of bricks, yet to one familiar with the technology involved there are practices, materials and processes that are common to each. It is much easier to see the similarity in problems of the whitewares group of manufacturers or in those of the heavy clay product group. There is value in manufacturers of a like product associating together on a program of technical investigation

through their trade association and by the same token there is value in all manufacturers having problems common to each being associated together.

The trade associations have found and proven the value in coöperative research. Some of them have continued their coöperative investigations over a period of years with increasing financial support. It is the hope of those who labor in the AMERICAN CERAMIC SOCIETY that every ceramic trade association will be so engaged.

The public and the legislators will soon realize the wide distinction between combined capitalization, in which individual concerns are merged, and the trade associations in which the individual concerns not only maintain their individuality but are strengthened in their economic and manufacturing position as individual concerns. Coöperation with their fellows and with representatives of the public on problems that affect directly the cost of production and distribution and the quality of the ware is a healthy combination of interests. If the AMERICAN CERAMIC SOCIETY can be as influential in promoting coöperative research by trade associations as it has been in promoting the establishment of government laboratories and collegiate ceramic departments it will have justified its support by manufacturers of ceramic products. This SOCIETY must continue to justify its existence by actual accomplishments, and no avenue for accomplishment is more productive than the promotion of technical investigations by trade associations.

PAPERS AND DISCUSSIONS

DISCUSSION ON "REFRACTORIES FOR OIL-BURNING FURNACES"[1]

By R. L. Frink:—In the October issue of the *Bulletin of the American Ceramic Society*[2] I was much interested in the discussion on refractories for oil burning furnaces, and particularly the remarks made by my old friend, Mr. Greaves-Walker, regarding the effect of oil upon refractories, which he describes as a rotting, due to the impingement of the oil upon the surface of the brick and the minute explosions which take place, his theory apparently being that because of these minute explosions and the extremely high temperature occasioned at the instant of the explosion there is a disintegration of the surface. While he does not say that exactly, yet, to my mind, it is the only inference that can be made from the theory as expressed.

I am in part inclined to this theory but not in the effect which I infer from his statement, *i. e.*, that there is sintering or actual fusion of the brick at the instant of these explosions and a subsequent disintegration because of continued or repeated explosions, for if such were the case the surface of the brick would not have the appearance of being rotten, as he expresses it, but would be more inclined to have the appearance of glazed or vitrified surface and while it is true that in many instances this is the characteristic of surfaces obtained the majority of surfaces are quite different. Therefore I venture to present another theory, which I suggested some years ago before the Society as relating to the effect of water smoking upon the chemical and physical characteristics of clays. That is, the effect of a sudden or pronounced increase of temperature over local areas in comparatively short periods of time, when such areas of clay have been subjected to a water smoking condition or the absorption and adsorption of compounds of hydrogen and carbon, as tar, soot or the absorption of hydrogen carbon gases; and then if temperatures are produced which before complete oxidization of this carbon occurs there is a temperature gradient within the clay sufficient to disassociate the hydrogen and silicon the presence of a moisture compound of silicon and hydrogen will be formed, with the result that the free silica or silica which is in excess as related to other components of the clay will be removed in the form of a gas of the methane, acetylene and other series of hydrogen silicon compounds, leaving behind a more or less porous mass whose surface is usually discoloured by a re-disassociation of the silicon hydride compound and precipitation of silicon.

I remember quite distinctly that some years ago when discussing this theory, it created considerable amusement. However, I think that later

[1] Received November 21, 1922.

[2] *Bull. Amer. Ceram. Soc.* **1** [10], 229(1922).

it was conclusively proved, although whether or not it became generally known I do not know, that in the making of paving brick, the density, resistance to abrasion or rattle test and other qualifications were, in one or two plants, quite satisfactorily controlled, particularly in oil fired kilns by regulating the relation between oil vapor or gas, steam and air, all of them being related to temperature produced within the kiln.

Noticing this discussion of Mr. Greaves-Walker, it occurred to me that reopening our old controversy might enliven a subject which, if thoroughly investigated, would not only be interesting but helpful and important to the clay industry generally.

I might also call attention to a recent experience in the burning of heavy Mexican oil, in which we obtained an effect similar to that which Mr. Greaves-Walker describes, *i. e.*, the rotting of the brick and also the opposite effect of glazing, but in this instance it was found that the glazing took place at remote or distant corners of the furnace where there was no direct impingement of oil or oil vapor upon the surfaces of the brick and this blaze was a brownish or black color and was primarily caused by the presence of sulphur, tellurium and vanadium while the rotting or disintegration of the brick was of a character which could be accounted for by the theory above expressed, for upon chemical and physical examination of the surfaces and the structure of the remaining refractory material, it was quite evident that a considerable quantity of silica had been removed.

Glass Research Association
London, England

DISCUSSION ON "CALCINING OF CLAYS"[1]

(1) Has there been any kiln designed and in use which will successfully calcine run-of-mine plastic fire clay to a temperature of cone 6–8?

(2) What is the most economical method of calcining clays? Compare calcining in ordinary kilns, in perpendicular furnaces, and in rotary kilns.

(3) What is the best and cheapest fuel to use in rotary kilns? What is the approximate cost to install, and operate, and the approximate capacity? Can powdered coal be used when calcining at a high temperature without injuring the clay?

Mr. Greaves-Walker:—We have here this morning a rotary kiln expert. I do not know that he has ever gone into the question of calcining clays but the operation of the kiln would be the same in any industry. Some of you have undoubtedly had experience in calcining clays in updraft kilns. I know that some of you have had experience in calcining in ordinary down-draft kilns hence we should get a very good discussion.

Mr. Austin will start the discussion on this subject and give his opinion as to the usefulness of the rotary kiln as compared with the down-draft kiln.

[1] Refractories Division, St. Louis Meeting, February, 1922.

MR. AUSTIN:—Of course, for calcining I approve of the rotary kiln, but it all depends on just how much calcining you have to do and also on the fuel. The fuel would depend on where your kiln was located. You can burn very successfully with oil, gas, and dust coal.

As to the installation, you can make it cost most anything that you want for there are so many different types. When calcining clay you can get perfect combustion. A great deal depends on the operator of the rotary as to the production of such a kiln. There are so many different angles to it that I do not know where to commence but I will try to answer questions.

MR. GREAVES-WALKER:—Can you give us an idea what a small rotary kiln installation, the smallest installation you recommend, would cost?

MR. AUSTIN:—To begin at the fuel end, we have to have pressure to handle the fuel, and the amount of pressure needed will depend upon both the fuel and the clay.

There are so many old rotary kilns in this country, if you want to make an economical installation you can pick one up for very little money. Then again it depends on where you are located.

There are many one-unit installations for grinding coal; and a great many in other fields. These are high speed equipments that go to pieces quickly.

Again you can use fuel oil. There are many different systems for fuel oil each having certain advantages.

You can put in a one-unit installation for $2000 that will give you a production from 48 to 75 tons a day.

MR. GREAVES-WALKER:—I think this question of calcining clays is of interest to a number in the fire clay business, especially those in the St. Louis district, because here the crudest method is used, that of calcining in down-draft kilns. This is, undoubtedly, the most expensive method.

With the necessity for reduced costs, the time has come when it is important to find more economical methods of calcining clays. They are shipping clays a greater distance now than ever before and even this attempt at saving in freight by calcining at the mines is at the present rates worth while. There is the question whether it would be better to calcine at the mines or whether it is worth while hauling that moisture in bulk from the clay mines to the clay plants.

MR. KRUSEN:—Would the use of powdered coal for fuel in a rotary kiln have any effect on the clay?

MR. AUSTIN:—You would have the ash, but if you use white ash coal, it would not affect the clay so much. It might run the silica higher.

My idea of a clay kiln is different from most other kilns for the reason that with clay you would not have to do any extra calcining and the operation could be done very quickly. The cement proposition as you know is different.

I believe you could calcine clay by closing up everything and getting almost perfect combustion. You still get your ash but you could easily take care of that in a small kiln. You would not need any stack draft, hence it would be very economical. Personally, I prefer dust coal to any other fuel; you can get any kind of a fire you want without any loss of fuel. When you use fuel oil, you have an atomizer to contend with, and if it does not atomize properly, you do not get good results.

MR. HARVEY:—I would like to inquire to what percentage the ash will reach. How much coal do you have to use per ton of clay calcined? Calcining usually runs about cone 6 to 8. If you know how much coal you are going to use, you can easily figure out what the percentage ash will be. Then you can tell how much it will lower the fusion point of the clay.

MR. AUSTIN:—That is something else. Every rotary kiln which I have installed, with one exception, has operated at a very high temperature. Where we burned to cone 20, with a particular coal, it took about 30% of fuel based on the amount of dead burning material, or about 600 pounds to the ton. You get 30% of fuel for the amount of tonnage that comes out. Of course, with clay there would be a considerable increase over this in tonnage production per amount of fuel used.

MR. HARVEY:—Do you mean 600 pounds of powdered coal per ton of finished product up to cone 20?

MR. AUSTIN:—Yes, sir.

MR. ROY G. SMITH:—Mr. Austin has had experience with rotary kilns at high temperatures. We have had experience with rotary kilns at low temperatures. Perhaps between the experience of us both we may get somewhere in this figuring.

We have a plant that makes face brick from a low grade of fire clay. This plant made pressed face brick for a good many years until they got the idea that they could make stiff-mud brick to better advantage. They installed a stiff-mud outfit, as we use those words in the clay industry. They found that the drying shrinkage of this clay was such as to rupture the brick before they got dry and hence it was necessary to use grog in order to get the brick through the dryer. We came to the conclusion that the rotary kiln would be the only possible way of making grog in sufficient quantities.

We installed a rotary kiln, 6 x 60 feet. This one cost us $3500. It was twenty years old and originally cost $3000. The entire installation cost us $20,000. However, about one-half of that was clay handling equipment which might not be considered essential to the rotary kiln installation.

The preparation of the material is very important, and also the disposition of it after it is calcined. Coming out of the rotary kiln in quan-

tities, after being at that high temperature it is very difficult to handle. It is necessary to have a mechanical feeder of some kind to put it in. If you have large lumps or wet clay, you have another problem on your hands.

We installed this rotary kiln under a clay chute at the railway track, about 28 feet off the floor line, and put a pan under the track. We dump directly from the car into the pan, put a feeder under the pan, feeding into a cast iron chute at the upper end of the kiln, and discharging at the lower end into a steel elevator and from this to an overhead conveyor which discharges the burned clay into the dry pans in proper proportions with the raw clay.

This kiln, as I said, is 6 x 60 feet. It makes one to two revolutions a minute. We use a variable speed motor drive. It takes 15 h. p. to run the kiln and 10 h. p. to run the feeder.

We use fuel oil, and find that $7^1/_2$ gallons of fuel oil is used to produce a ton of clay. However, our temperature only goes to 1000° to 1200°F, as the nature of this clay is such that the shrinkage is practically taken out of it at that temperature.

The lining and the fuel, the clay supply, and the clay disposition after it is burned seem to me to be the governing factors rather than the rotary kiln itself, so it is just a question of getting these things lined up to accomplish whatever you start out after. As Mr. Austin suggests, each problem would have to be studied by itself, and proper arrangements made to meet these peculiar conditions in each particular installation.

Mr. Greaves-Walker:—Mr. McDowell, your Company, I believe, has attempted to use shaft kilns at some plant in Pennsylvania for calcining clays? Have you any information you could give the gentlemen on the method?

Mr. McDowell:—That method was not applied by us on plastic clays.

Mr. Greaves-Walker:—I think the same thing would apply. The difficulty with most methods, either the rotary kiln or the others, is in handling finely-divided clay, that is the clay that is crushed down. Of course, in the rotary you crush it down, the smaller the better within certain limits, but I think the great question to everybody who has not used a shaft kiln, is how they can handle the fines, *i. e.*, whether they can use the kiln run of calcined clay or will have to separate the fines. Can you give us any information on that?

Mr. McDowell:—We used no fines in those kilns. The material fed into them is entirely clay lumps.

Mr. Christopher:—Our shaft kiln is fed directly from box cars, and discharges at the bottom from which we haul in trucks to cars. This kiln will hold three ordinary box car loads or about 140 to 175 tons of clay. We use lumps and do not use frozen clay for it would crack and all go to fine clay thus choking the kiln.

This kiln is about 28 to 30 feet high and about 14 feet inside diameter. We burn this 140 or 150 tons of clay to a red heat with coal. I have burned that kiln off with as low as 18 tons of coal.

MR. GREAVES-WALKER:—Mr. Christopher, can you not work that as a continuous kiln, merely taking it out at the bottom as you put it in the top?

MR. CHRISTOPHER:—I see no reason why it could not. Our kiln, however, was not built on piers. It was built on the ground.

There is no reason I know of, especially if you get choice flint clay, why you could not have the kiln right at the loading station along the railroads. In that case you could build the kiln on piers and have the firing platform above, much the same as with lime kilns. I rather believe McLean tried that at Rosewood.

MR. KRUSEN:—I believe he burned off something like 10 or 15 cars of clay altogether in that kiln, but he tried to use clay from the pit that was very plastic. It was not in big lumps. When they used large lumps they were rather successful, but his idea was to use clay from the pit. At that time nearly all the available clay was not in lumps but I think his plan was fairly successful for large lumps.

MR. SCHWETYE:—We haven't found any difficulty in calcining clay in a round down-draft kiln. When we use only lumps, we get a better draft, it will burn better, but you can use a certain percentage of fines.

MR. GREAVES-WALKER:—What is the fuel consumption?

MR. SCHWETYE:—Burning up to cone 12, the fuel consumption will run about one-half ton of coal to a ton of clay.

MR. CHRISTOPHER:—In calcining clay in a round down-draft kiln, the biggest coal saving that I know of is to be sure that your flue openings are open after your kiln is set. Our kilns have 40 to 50 square floor openings, each of which opening is covered with three flat tiles, three high. On top of these tile we set a 9″ round refractory tile similar to a chimney tile. After everything is set we take a long iron rod and spread the tile directly over floor opening so as to allow proper draft.

These floor tile on the bottom must be properly spaced and the clay punched out of them. In that way we can save about 40% of our fuel. I find that you can save more coal and more time with an hour's work in that way than you can in any other.

MR. GEIGER:—I should like to ask two questions, first as to handling of block plastic clay in calcining and what the cost per ton is for firing plastic clay to cone 12, regardless of the method and regardless of the treatment given it beforehand.

MR. GREAVES-WALKER:—Mr. Talbot, you have had some experience in running out fire clay into blocks.

MR. TALBOT:—In our experience, we found that it is better to grind the clay, then form and set them just as we do brick. If I remember correctly, it used to run around 1600 pounds of coal to the 1000 brick. This made the yield about $3^1/_2$ tons of clay to the ton of coal.

DISCUSSION[1] ON "MECHANICAL METHODS FROM CLAY BANK TO MACHINE"

MR. TEFFT:—This is a subject we are all interested in because there is such an opportunity to improve most of our plants with labor-saving devices. While it is impossible to apply the same remedy for correction of costly clay gathering apparatus to each plant I am sure that a general discussion now will bring out certain methods that can be applied in most cases.

MR. LANGWORTHY:—It is rather difficult to participate in a discussion of this sort as there are so many different methods that are satisfactory depending upon the actual problem. It is my judgment that each individual case must be studied before a definite plan for handling the clay can be made up.

A MEMBER:—I want to put in a system of some kind to get the clay from our shale pits into the plant. I am figuring on belt conveyors and in one place in our plant, we have a "button" conveyor that is about 60 or 70 feet long which works very satisfactorily. I should like to know where anyone has used the "button" conveyor. What I have reference to is a wire cable operating in a trough, this cable being equipped with metal buttons spaced short distances apart.

In my case, I think they are 14 inches apart with 6- or 8-inch buttons. This operates very satisfactorily in a small way. If the clay is a little bit wet the buttons or the cable will ride on top of the clay, but if a hump is put in there is no trouble.

I once discovered one of the men riding this conveyor to hold the cable down. The clay will stick in the bottom and the button will creep up over it if it is not forced down or have a hump over which to travel.

MR. SMITH:—Do you put that hump in there in order to force the buttons to the bottom of the trough that they run in?

A MEMBER:—Yes.

MR. SMITH:—You are then building up friction against which you are pulling.

MR. BROWN:—I have had experience with "drag conveyors." There is a conveyor in which the belt is supported underneath by means of boards or metal plates instead of rollers and contrary to all expectations, they

[1] Heavy Clay Products Division, St. Louis Meeting, February, 1922.

have given excellent service and proved to be durable. It is obvious that they must consume more power than when the belt is supported on rollers, especially if the roller axles are provided with good bearings.

I have supplied the metal parts for "drag conveyors" at various times under protest and witnessed them in operation in various lengths to 80 and 90 feet long and was surprised to find them giving satisfactory results over a long period of time.

As compared to a conveyor having the belt supported by concentrating or troughing rolls, I am certain the latter will show a decided saving in power.

MR. TEFFT:—If the distance is not extreme I believe a belt conveyor is more satisfactory for most conditions than any other installation unless it is applied to a place where either the discharge end or the feeding end is a movable proposition. In such a case I believe you would spend more money on the conveyor to keep up with these moves than you would get out of it while it is in operation.

MR. BROWN:—I am not a clay worker but an engineer specializing in clay working machinery and in our practise, we have found that for comparatively short distances and with dry material the "button" conveyor will work successfully. We have tried to improve the belt conveyor as this type requires less power and when correctly built, will outlast the "button" type of conveyor and has greater capacity. It will work in short lengths or in long lengths up to several hundred feet long.

For handling waste clay in the machine room where the particles of clay are wet and surfaces somewhat oily from passing through a cutter, a flat belt conveyor is generally most satisfactory. In the storage shed and when handling raw clay, it is best to use concentrating or troughing rolls under the belt to prevent material from falling over the edge of the belt.

These rolls should be equipped with good self-oiling bearings, something that will not require frequent attention and will keep the bearings properly lubricated and exclude dirt.

With a properly designed and built belt conveyor, the installation will work continuously for years with a minimum of expense and attention. With the addition of a tripper, it can be made to discharge at any point along its length.

MR. TEFFT:—Our experience has been the same as Mr. Brown's. We have in our Milton Plant a 20-in. wide belt conveyor that is 115 feet long and another one that is about 150 feet long. They are, of course, under cover so that the belt is protected from the weather. With this protection we find that these belts will last several years.

I know one of the belts that we only recently took off had been on there for seven years.

We find however that where the loading point is changing it is very hard to beat a locomotive with cars. The conveyor is all right if you have the right type of shale planer, *i. e.*, one that works on a pivot and does not have to travel back and forth across a long face. Is that the type you have?

A MEMBER:—Yes.

MR. TEFFT:—We are using an Arbuckle type cutting a face about 300 feet long. We feel that it would cost us more to get conveyors up to the machine and keep them traveling with it at successive moves of the planer into the hill than it would to put the clay in cars and pull them with a locomotive. Mr. Smith, I believe you said your experience was the same.

MR. SMITH:—Yes, that has been my experience. We have another plant where our clay pit lies directly below the clay shed. There we use the truck car. This is an ideal condition. It is an illustration of the point that you must base each problem on its merits and settle it according to what you find.

MR. BROWN:—It is customary in a lot of plants to bring the clay up to the foot of an incline by means of a locomotive or a horse and then elevate it by means of a winding drum. A lot of these plants by making their incline longer could take it all of the way with their locomotives and save two or three men in that way. The hauls generally are short and you could extend the tramway back toward the pit so as to make the haul the entire distance by means of a light locomotive. There are many gasoline-driven locomotives that are more economical to operate than a steam locomotive.

The steam locomotive generally is heavier and should haul longer trains, that is, more cars, but you can haul enough generally with a three-ton or a four-ton locomotive and you can make your tramway heavy enough to carry that locomotive and three cars. You can also save the winding drum and the men required to operate it, and I think that in changing or designing a plant in the future, that should be taken into consideration because you want to save as many men as you can.

MR. SMITH:—Mr. Brown, what do you consider the maximum grade that is economical for operating a locomotive as compared with the winding drum?

MR. BROWN:—An 8% grade is supposed to be the maximum at which they can be operated successfully. They do not really work to advantage on steeper grades.

MR. SMITH:—With a train of four yard cars what would you consider the maximum grade one of the locomotives would climb efficiently and economically?

MR. BROWN:—I am not advertising our locomotive. Any locomotive

could haul one-fourth its own weight, that is, the draw-bar pull should be one-fourth its own weight, and the draw-bar required to move a ton of material is something like thirty pounds, and then for every 1% of grade incline twenty more pounds would be added, making thirty pounds. For instance, if you have an 8% grade, that is 160 pounds plus 30, making 190 pounds draw-bar pull required to haul a ton up that incline. The weight of the locomotive in that case was five thousand pounds from 1/5 to 1/4 the weight of the locomotive would be your draw-bar pull under these conditions. An 8% grade is a rather difficult grade for a locomotive, since they do not hold to the tracks as well as on the level ground.

The above are approximate figures only as each case must be regarded as an individual case.

A good idea of what is possible may be had when I tell you that on a straight and level track, with cars equipped with a high grade of ball or roller bearings in good order and properly lubricated, seven pounds draw-bar pull will move one ton and that in practice, from 20 to 60 pounds draw-bar pull is required to move one ton.

Therefore, it would seem to me that we are not giving sufficient attention to certain details such as grades, curves, weight of rails, condition of road bed, condition of cars, etc. as there is an opportunity for saving power and wear and tear all along the line whether you use a horse, winding drum, a locomotive or any combination of these.

A MEMBER:—We are doing what Mr. Brown has suggested by pulling our clay in with the locomotive. We get the locomotive behind the loads. We carry three-, four- or six-yard dump cars. From the block down to the by-pass track it is about 250 feet, and 7 1/2% grade.

A run is necessary at that grade, especially if the track is wet. We allow our empty cars to drop to the pit by gravity and these by-pass.

MR. BROWN:—What size locomotive have you?

A MEMBER:—Ten by sixteen, steam locomotive.

Mr. STEVENS:—In connection with the general problem of the most economical way to transport raw materials to the plant, I think the most striking example of efficiency along that line that I have ever seen is of the Streator Brick Company at Streator, Illinois.

They use the large drag line, a Marion, it is called, a large-sized machine, and an extensive installation. The drag line is located on top of the shale bank, and they bring the shale up to the top of the bank to load the cars. The top of the bank is higher than the level of the plant, consequently the loaded cars go to the plant by gravity and then a special differential hoist arrangement is used whereby the pull of the loaded cars helps to pull the exemption back up. A drum will boost them along if this is not sufficient, but to a very considerable extent the gravity force of the loaded cars pull the empties back.

MR. TEFFT:—That is another example where it pays to study the peculiar situation that you have before you.

MR. POTTS:—I do not know anything about Mr. Vincent's conditions but it seems to me that a light locomotive and cars would put the clay in cheaper than the belt conveyor.

We have been using a locomotive made out of a Ford engine made by the Parkville Truck Company, costing less than $1500. That handles the car over an 8% grade without any trouble and the maintenance on it is very low; it takes about 4 to 5 gallons of gas a day, and probably takes between a pint and a half and a quart of oil—lubrication oil. One man can run it, and that man dumps his own car when he gets into the plant.

As I remember the conditions there, the bank is higher than the clay shed, and you are practically downgrade, or on the level with the loading. When we bought the locomotive we expected to have the same conditions but we discovered we had a drop there and that put us a little below our plant. I think you could buy the locomotive and cars for less than it would cost you for the best conveyor and the maintenance would not be much.

DISCUSSION ON "TENTATIVE SPECIFICATIONS FOR GLASS HOUSE REFRACTORIES"[1]

MR. ROSS:—During the year the Standards Committee of the Glass Division has been asked to prepare tentative specifications on lime for use in glass and on refractories for use in the glass industry. As Mr. A. E. Williams is particularly familiar with the specifications on lime, I have suggested that he take them in charge when they come up for discussion.

As to the Standard Specifications for Glass Industries Refractories, my personal opinion, after having worked with this matter for the last two and one-half years, is that our present knowledge of this subject is entirely too meager to permit of us drawing up satisfactory Standard Specifications at this time. I further believe that the present Committee's report might well serve as a basis for discussion at this meeting, which discussion may be of value to future committees dealing with Glass Industries' Refractories.

In conclusion, it appears to me that what we need now is more research along these lines and no final Standard Specifications except as each point is thoroughly proved out and that in this way injustice to any and all can be avoided.

The Committee's Report on Glass Industries Refractories follows:

[1] Glass Division, St. Louis Meeting, February 28, 1922.

REPORT OF COMMITTEE ON GLASS INDUSTRIES REFRACTORIES

Introduction

The effort of this Committee has been to develop a set of specifications that will aid the consumer in getting what he needs, and then obtaining the most service from what he gets, and at the same time to be a guide to the manufacturer in supplying it, without working a hardship on either. We believe that such a set of specifications, when ultimately worked out with proper limits, should even be an aid to the manufacturer in producing better grades of refractory wares.

Our aim has been to obtain limits that actually apply to the wares as now made, where possible pointing the way to better practice, and where it is necessary to apply tests, having them of such a nature that the results will distinguish clearly between satisfactory and unsatisfactory products. At the same time, knowing that a large percentage of the plants manufacturing and using these products are still unequipped with laboratories, it has been our aim to have all tests so arranged that they can be applied on any plant without special laboratory equipment. This has been done to permit of ready application of the specifications under existing conditions.

In so far as they apply the committee has endeavored to use the A.S.T.M. specifications for refractories, notably the reports of Committee C-8. However, there are several requirements that are essential to refractories used in the glass industries, that are of minor importance to refractories used in other industries. Hence it has been necessary to devise several more or less new tests. These have been worked out by observing the peculiarities of the various wares in service, and then selecting from the mass of laboratory tests on hand those which most clearly delimit (prescribe the limits of) the particular requirements under consideration.

The specifications herein set forth are of necessity of a tentative nature. We believe that the general plan will prove satisfactory, but that a great deal of thought must yet be given to the subject, and considerably more data be collected relative to proper limits, etc., before these tentative specifications can all be accepted as standard.

Many of the limits are already quite well established, while others need more weight of evidence.

Heat treatments are expressed in cone numbers, the temperature measuring instrument being depended upon merely to indicate the progress of the furnace. It is preferable however to use accurately calibrated instruments and record exact temperatures in addition to the cone numbers.

An effort has been made to correlate all the tests and their limits, so that one specification will not conflict with another.

It appears very desirable to have a hot bending test for pot clay at

glass melting temperatures, which in a measure at least will correspond to the bulging of pot walls. It also appears desirable to have a test which in a measure corresponds to the shrinkage that takes place in the pot while it is in the pot arch, and the additional shrinkage which must take place before the pot can be considered to be in a satisfactory condition for use.

The limits, etc., of the load test have been so thoroughly worked out that we believe there will be no need to alter them in the future. Hence, the results of such tests may well form a basis for correlation of other tests. 1 (*b*) and (*d*) have been worked out for use in lieu of the load test, where a load test furnace is not available.

Under Clay Refractory Blocks and Bricks, for Class A materials, the limits correspond to those usually used for first grade clay refractories, while for Class B materials, the limits include what are generally considered as second and third grade clay refractories. The limits of this test have been quite thoroughly worked out and correlated with results of the load test.

The limits, etc., for the hot bending tests and for volume change of pot clay during firing are not as thoroughly worked out as we hope to see them later.

Specifications

1. Clay Refractory Blocks and Brick.—Class A: Materials which are intended to be exposed to the direct heat of the furnace and to be either subject to the action of dust or not, but not to be in contact with the glass itself.

(*a*) These materials (cut to the form of standard 9-inch brick) when subjected to a load of 40 pounds per square inch, and heated as follows, in the usual form of load test furnace:

Time	Temp. °C	Time	Temp. °C
0 hr.	0.0	3 hrs.	1200
½ hr.	370.0	3½ hrs.	1270
1 hr.	670	4 hrs.	1320
1½ hrs.	880	4½ hrs.	1350
2 hrs.	1020	5 hrs.	1350
2½ hrs.	1120	5½ hrs.	1350
		6 hrs.	1350

Bricks so tested shall not yield in compression more than 4% (measurement to be made on cold brick after test).

(*b*) In the case of aluminous material the softening point[1] should not be less than that of cone 31 and pieces cut (or moulded) to form standard 9-inch brick on being heated to 1400°C (2555°F) in 4 hours and held at that temperature for 5 hours, shall not expand more than 1%, nor con-

[1] U. S. Bureau of Standards, *Tech. Paper* 7, also see method of No. 1 below.

tract more than 1.5% linear. Not many people keep their thermocouples accurately calibrated, hence in lieu of the above test we suggest that cone 15 be brought down in 4 hours and that this temperature be maintained for 5 hours by means of a thermocouple which will indicate the progress of the test furnace but which need not be calibrated to indicate the true temperature.

In the case of siliceous brick the softening point may be as low as cone 28, provided the compression in the load test, as described above, is less than 3%.

(*c*) Bars 3 x 1½ x 12″ made of the raw refractory batch and fired in a commercial kiln with refractory blocks, when supported on knife edges (10-inch span) loaded at the center (M = 10 pounds per square inch) and heated in a test kiln to cone 15 (cone 15 in 6 hours and held at this temperature one and one-half hours) shall not sag on the under side more than ½ inch below the knife edges.

Class B: Clay Refractories which are not directly exposed to fire or glass attack (such as materials used in backing up).

(*d*) These clay refractories should have softening points between cones 26 and 31. The limits shall be the same as for first grade refractories above when a standard 9-inch brick sized piece is heated to 1270°C (cone 12) in 4 hours and held at that temperature for 5 hours.

In lieu of a calibrated thermocouple we suggest that cone 12 be brought down in 4 hours and that this temperature be maintained for 5 hours.

(*e*) Dimensions of all materials in A and B must not vary more than 3/16-inch per foot from specified dimensions. Bricks and blocks in both classes must be reasonably well made and correspondingly free from drying and burning defects, such as cracking, warpage and improper oxidation.

Silica Refractories.—(*a*) Silica brick and tile should have a good ring.

(*b*) In order to insure satisfactory quartz, cristobalite, tridymite relations, the specific gravity[1] should not be over 2.38 for brick made from Medina quartzite, nor more than 2.42 for brick made from Baraboo quartzite.

(*c*) The effective modulus[2] of rupture of standard 9-inch brick, set on edge on knife (6-inch span) should not be less than 500 pounds per square inch.

(*d*) The softening point[3] shall not be less than that of cone 31.

3. Flux Blocks.—(*a*) The softening point[1] determined on cones made from a ground sample (60-mesh) of the block, shall not be less than that of cone 29.

(*b*) The porosity[4] of tank blocks shall not be over 25%.

[1] See method 2 below.
[2] See method 3 below.
[3] See method 1 below.
[4] See method 4 below.

(*c*) Crucibles made of the raw flux block mixture, in a mould as per the accompanying sketch, fired in a commercial kiln with flux blocks (or optical to cone 12 in a test furnace in 6 hours and held one and one-half hours) and subjected to a three day fluxing test at the temperature and with the glass (cullet) against which the blocks are to be used, shall show but little attack. The amount of attack can be observed either by cooling the crucible with the glass in it and splitting the crucible vertically through its center, or by pouring the hot glass and inverting the crucible in the furnace for a few minutes to drain. It can then be studied without being broken.

(*d*) The porosity of $2^1/_2$-inch cubes cut from fired blocks and reheated in a test kiln (1400°C in 6 hours (2555°F) and held at that temperature for one and a half hours) shall not have a porosity greater than 22%, nor less than 12%. The volume change determined by suspended weight method[1] shall not exceed 6%, nor be more than 1% expansion. In lieu of a standardized thermo element, we suggest cone 15 in 6 hours and that this temperature be maintained for 1.5 hours.

(*e*) The requirements for dimensions, etc., shall be the same as for 1 (*e*). Rectangular blocks shall be truly so and not merely have opposite sides parallel.

4. Glass Melting Pots.—(*a*) The softening point[2] determined from cones made of the raw pot mix, when ground to pass a 65-mesh sieve, shall not be less than that of cone 30, and the softening point of any individual plastic clay constituents of the mix, similarly treated shall not be less than that of cone 29.

(*b*) Bars 1 x 1 x 7″ made from raw pot body, and fired in a test furnace to cone 15 (cone 15 in 6 hours and held at this temperature for 1.5 hours) when supported on knife edges (5-inch span) loaded at the center (M = 7 pounds per square inch) and reheated in a test furnace to cone 15 the same as they were the first time, shall not sag (measured on the under side) more than one-half inch below the knife edges.

(*c*) The total shrinkage[3] of the pot mix from the wet raw state (consistency of side clay) to the condition after being fired to cone 14 in a test furnace (cone 14) in 6 hours and held at this temperature (1.5) hours shall not be over 24% (approximately) by volume (3% linear) based on per cent of wet size. The shrinkage between cone 4 and 14 (determined on pieces previously burned to cone 4), when heated same as above, shall not be more than 3.9% (approximately) by volume (1.3% linear). These figures are based on a drying shrinkage of 15% (approximately) by volume (5% linear) and a burning shrinkage to cone 4 of 5.1% (approximately) by volume (1.7% linear).

[1] See method 5 below.

[2] See method 1 below.

[3] See method 5 below.

(*d*) Bars 1 x 1 x 7″ made of the raw pot mix, when dried and broken according to the tentative method of the AMERICAN CERAMIC SOCIETY[1] shall not show a modulus of rupture less than 225 pounds per square inch.

Any material failing in any one test shall be discarded as unsatisfactory.

Methods of Procedure

1. Softening Point.—The sample shall be ground to pass through a 65-mesh Tyler Standard Screen (0.208 mm.) mixed with water and molded into cones similar to Seger-Orton pyrometric cones (tetrahedra, 7 mm. along an edge of the base and 30 mm. high). If the sample be non-plastic, a little organic glue may be added, so that the cones will hold together when dry. The cones shall be set in a straight line in a plaque. A dried cone of the sample shall be set in the plaque with not more than 2 Orton cones on each side of it. Thus none of the standard cones need be more than $^3/_4$ inches away from the material being tested. The heating shall be done in a gas-fired or other furnace in which the atmosphere is maintained nearly neutral (not strongly reducing). The total period of heating shall not be over 2 hours. The rate of heating, near the softening point of the material, should not be greater than that required to cause the bending of one standard cone in 3 minutes.

2. Specific Gravity of Silica Brick.—$2^1/_2$-inch cubes of the dried material are weighed, saturated with water and weighed wet, then weighed suspended in water. In terms of grams and cubic centimeters the specific gravity $= \frac{D}{(W-S)-(W-D)}$ where D = dry weight, W = wet weight (saturated weight) and S = suspended weight.

3. Effective Modulus of Rupture.—The effective modulus of rupture is obtained by subtracting the average deviation from the mean modulus of rupture. The average for this figure shall be made from data on not less than six bricks. The modulus of rupture is calculated by means of the following formula: $R = \frac{3WL}{2bd^2}$, where R equals modulus of rupture, L equals distance between supports in inches, b equals breadth of specimen in inches, d equals depth of specimen in inches, and W equals load in pounds at which failure occurs. The mean modulus is merely the arithmetical mean of these figures, and for the effective modulus we have: Effective R = mean $R = \sqrt{\frac{S}{N-1}}$, where S equals the sum of the squares of the differences between the various observations and the mean modulus, and N equals the number of observations.

[1] Report of Committee on Standards, Jan. 3, 1918, pages 40–43.

4. Porosity of Burned Clay Products.—$2^1/_2$-inch cubes of the dry material are weighed, saturated with water and weighed wet, then weighed suspended in water. Then, in terms of grams and cubic centimeters, the porosity (ratio of the volume of the open pores to the exterior volume of the piece) $= \frac{W-D}{W-S}$, where D = dry weight, W = wet weight (saturated weight), and S = suspended weight.

5. Volume Change by Suspended Weight Method.—$2^1/_2$-inch cubes of the material are saturated with water and weighed wet, then weighed suspended in water, after which they are dried and reheated. Saturated and suspended weights of the reheated pieces are taken. The volume change $= 1 - \frac{W_2 S_2}{W_1 S_1}$, where W_1 = wet weight (saturated weight) before reheating, S_1 = suspended before reheating. W_2 = wet weight (saturated weight) after reheating and S_2 = suspended weight after reheating.

If it is desired to measure the change in volume from the raw to the fired state, the pieces may be run in oil both before and after firing. Or if run in water after firing, the readings in oil must be converted to a water basis by dividing by the specific gravity of the oil as: $\frac{W_1 - S_1}{\text{sp. gr. of oil}}$.

Addendum

As soon as possible data should be obtained for a heating schedule to be used in heating glass melting tanks. At present we can only suggest the following:

In days 1–75°C (167°F); 2–120°C (248°F); 3–234°C (450°F); then 94°C (200°F) per day to 1250°C (2300°F). In heating window glass tank blocks for hot repairs the same schedule is suggested to 900°C (1657°F), then hold for 36 hours.

The present specifications as far as pots are concerned deal only with the constituents from which the pots are made. It is hoped however that we may soon be able to outline a standard method of handling pots by the consumer, and of their preparation for the furnace.

At present we can only suggest that pots, tank blocks, refractories, etc., stored by consumers, be kept above 90°F (32°C) at all times.

With pots which have been stored as above, the following heating schedule is suggested.

In days 1–75°C (167°F); 2–120°C (248°F); 3–371°C (700°F); 4–596°C (1110°F); 5–816°C (1500°F); 6–1025°C (1880°F); 7–1160°C (2120°F); (check with cone 4 flat under center of bottom) 1 hold 30 hours.

The pot arch should be cooled to 32°C (90°F) before pots are placed in it. If a pot arch is cold it should be dried out by heating to redness

and then cooling to 32°C (90°F) before pots are placed in it. Where pots are to be set directly in a pot furnace at time of starting up, the furnace should first be dried out by heating to bright redness and then cooled to 32°C (90°F) before the pots are placed in it.

It is essential that the pot arches be constructed so that the bottoms of the pots will be as thoroughly heated as the crowns. Pot arches of the down draft type, with exit flues directly under the center of the pot, largely aid in obtaining this uniformity of heating throughout the pot. In easily applied check on the uniformity of heating in the pot arch is to place one pot of cones under the center of the bottom of the pot, and a similar set on top of the crown, cones 01 to 5 inclusive usually serve for this purpose. It may even be desirable to go much higher than above suggested.

It is desired to establish as soon as possible, a fluxing test for pot clay, of the same general nature as that given for flux clay.

Donald W. Ross, *Chairman*
George A. Loomis
Arthur F. Gorton
C. W. Berry

Mr. Hostetter:—You have heard these recommendations and comments of our Committee. It seems to me we may well discuss them, not in their entirety, but separately. We could possibly take the items, "Glass Melting Pots," "Flux Blocks and Clay Refractory Blocks and Bricks and "Silica Refractories." The Committee speaks of cone 27. I have asked the different men what it meant. The answers varied 1670°C, 1620°C, and 1650°C. Cone 27 means something to some of the members but the temperature in Fahrenheit would mean more to the rest of us.

Doctor Washburn:—A paper is to be presented on this subject by Mr. Sieurin.[1] It gives some very interesting results which seem to point in the near future to being able to replace fusion point specifications and load specifications by chemical composition specifications and porosity.

Mr. Grafton:—I am sure the clay pot and tank block manufacturers wish to coöperate in every way with the Glass Division in arriving at the standardization of these products, but we do not think it is advisable to adopt any particular standard until the matter is more fully considered.

This test calls for a fusion test of cone 27 to 28, and a softening point between cone 29 and 30, which is 3000°F. That is a pretty high test for some of our clays. Some of the clays we use will not stand that test.

The Gross-Almerode clay would not stand at cone 26. The glass manufacturer is demanding that his product be made from German clay. If these specifications are adopted, it would practically eliminate the use of German clay in our product. We are all trying to find a batch that will

[1] Sieurin and Carlsson, "Resistance Tests on Fire Bricks under Loads at High Temperatures," *Jour. Amer. Ceram. Soc.*, **5**, 170 (1922).

give longer life to the tanks and pots and while some may feel that our domestic clay is superior to the German clay, a great many believe that the German clay is better.

The clay pot manufacturers have recently appointed a committee on this subject, and they would be willing to ask that committee to act in connection with a committee of the Glass Division. The two parties could consult with Committee C-8 of the A.S.T.M.

I move that we adopt that part of the report of the Committee which states that in view of the limited data available our Committee considers it inadvisable to propose a large number of tentative specifications for glass house refractories until the question has been given a more practical study. I also move that a committee be appointed from this Division to consult and confer with the Committee C-8 of the A.S.T.M.

MR. BROWN:—Mr. Chairman, I second that motion.

MR. HOSTETTER:—You have heard the motion and it has been seconded. Dr. Silverman states "If our recommendations are approved by the Glass Division, we suggest that they be submitted to the General Committee on Standards of the AMERICAN CERAMIC SOCIETY for their consideration and for final approval by the SOCIETY at large." This is one of the duties of the Committee of the AMERICAN CERAMIC SOCIETY to confer with the Committee of the A.S.T.M.

MR. ROSS:—Some time ago, when this matter first came up, arrangements for a conference with the A.S.T.M. were started, but it has not been held, as I understand the A.S.T.M. Committee has not yet been assembled.

MR. BROWN:—When that Committee, of which I am a member, was appointed a year ago, I wrote to Doctor Silverman, that some of us knew absolutely nothing of specific facts about glass house refractories. On the other hand, we had men who were experts who did not have data available on matters such as lime. The same Committee had to handle both specifications, and in my case I could do nothing in the question of refractories. Lime and other glass house raw material should be considered by a separate committee. We have in our factory several grades, in which, used by another company, the specifications set by Mr. Williams made it questionable. This Refractory Committee has done good work, but I think the motion as made and seconded is right and the matter should be further considered.

DOCTOR WEBB:—Mr. Grafton has told us one possible effect which the adoption of one of these specifications might mean to the manufacturer. Would it not be well, by means of a questionnaire to find out how all of them would be affected should it be adopted, and have that available for the Committee?

MR. GRAFTON:—A communication was received from Secretary Purdy.

It was requested that the clay pot and clay manufacturers appoint a committee to work in connection with Dr. Silverman's committee.

MR. HOSTETTER:—These specifications, as proposed, are not entirely satisfactory, even as tentative specifications, but personally I should like to see the Committee working on one subject, reduced to a minimum. Now, whether the report should be referred back to the Committee on Standards, expressing the sentiment that we didn't consider the job as having been fairly done and suggesting a questionnaire to the glass house refractory men, or whether we should appoint an additional committee is the point I have in mind.

MR. ROSS:—There is a Standards Committee in our Division, and that Committee will have this matter in charge as far as the Glass Division, the membership of which is appointed each year for one year of service, is concerned.

MR. BROWN:—The matter has been pretty well discussed and three members of the Committee are here; the first part of the report is in two parts (1) refractories and (2) lime specifications. Mr. Grafton has made a motion which has been accepted not to accept the report as turned in, but only part of it. If that is put to a vote, we can dispose of that and then go to the lime which will be accepted probably, and then the committee can be discharged and you can appoint a new committee, one to handle refractories and the one raw materials.

(The motion was carried.)

DISCUSSION ON "ELIMINATION OF STREAKS IN WHITE OPAQUE GLASS"

MR. HOSTETTER, CHAIRMAN:—When I read this title I wondered whether the gentleman who proposed it has in mind glass that is to be (1) blown or (2) cast and rolled, or (3) pressed in small units. Certainly the three types of working require substantially three different types of glass.

MR. PAYNE:—Dealing with the third type, you can eliminate streaks by using a substitute of small articles to be pressed. We probably have made as much opaque ware as anybody in the country. I cannot tell you how to eliminate streaks, but I can tell you of the things that cause them. We run ordinarily 250°F in our opal vats, and 50° excess heat will cause a tremendous number of streaks. We get some with flint glass mixed in. It is more or less transparent and shows dark, and there may be some gas or crystal that will cause it as well. It can easily be done when we make a shift from natural gas to oil, or the other way round.

ACTIVITIES OF THE SOCIETIES

BREAKING INTO THE MOVIES

The sporty editor of the BULLETIN always tries to be seasonable.....

This month while the wind blue chill the members of the SOCIETY have been practicing that popular pastime known as ski-jumping. Fifty-five, donning their moccasins and earmuffs (over their custom-mades), entered into this blood-warming exercise, and may now be seen at any movie on Tuesday or Saturday nights. Those with long legs have a natural advantage of course, but this should not be allowed to discount the work of Charles A. Smith, of Columbus, who made leap after leap until he lep clear off the end of the slide and the tape of the judges gave out entirely. He ended at least thirty feet in advance of his nearest competitor, R. R. Danielson of Ellwood City, Pa., who is hardly in the long-legged class but nevertheless was thirty feet ahead of the next man. D. F. Albery, of Chicago, and Alexander Silverman, of Pittsburgh, tied for third place.

Ira E. Sproat, the tallest man in captivity (at least we think he's married), after three classic leaps, did a tail spin that brought home the real bacon in the form of a Corporation Member. Four charter members threw their dignity over the fence and showed the youngsters where to head in, by doing similar stunts, each bringing in a Corporation Member. These were F. W. Walker, S. Geijsbeek, Edward Orton, Jr., and H. C. Mueller. E. C. Sullivan, V. A. Giesey, H. F. Kleinfeldt, and W. H. Herbert followed suit. The score card follows:

	Personal	Corporation		Personal	Corporation
Charles A. Smith	11		J. W. Cruikshank	1	
R. R. Danielson	8		R. V. Widemann	1	
D. F. Albery	5		W. E. Dornbach	1	
Alexander Silverman	5		F. H. Auld	1	
Ira E. Sproat	3	1	A. V. Bleininger	1	
R. K. Hursh	3		Miss Mary G. Sheerer	1	
P. H. Swalm	2		Miss Mabel C. Farren	1	
R. F. Segsworth	2		C. H. Modes	1	
E. W. Tillotson	2		Joseph A. Martz	1	
A. Malinovzsky	2		E. H. Fritz	1	
T. W. Garve	2		D. A. Moulton	1	
F. W. Walker		1	E. A. Brockman	1	
S. Geijsbeek		1	F. C. Flint	1	
Edward Orton, Jr.		1	K. N. Endell	1	
H. C. Mueller		1	A. E. Williams	1	
E. C. Sullivan		1	F. K. Pence	1	
V. A. Giesey		1	D. M. Thorpe	1	
W. H. Herbert		1	Chas. A. Nicely	1	
H. F. Kleinfeldt		1	Leon J. Frost	1	
H. S. Langworthy	1	1	Charles F. Geiger	1	
A. O. Austin	1		Leslie Brown	1	
C. F. Binns	1		Wm. Cannan, Jr.	1	
F. H. Rhead	1		J. S. McDowell	1	
G. Percy Cole	1		W. M. Jacobs	1	
P. H. Walker	1		Charles G. Lippert	1	
C. E. Bales	1		Edmund Brown	1	
W. F. Wenning	1		A. Weber, Jr.	1	
R. E. Griffith	1		Office	29	

Total 110 Personal, 10 Corporation

H. S. Langworthy made a clever jump and swung around the circle with a Corporation Member hanging to his coonskin cap. R. K. Hursh made three jumps of great brilliance, while P. H. Swahn, R. F. Segsworth, E. W. Tillotson, A. Malinovzsky and T. W. Garve each made two. Of course it was comparatively easy for a Canadian but how they do it in California is something for Mr. Einstein to explain. Thirty "also-entereds," among them two of our better halves, did themselves and the Society credit without receiving a D. S. O. for it.

What really makes this ski-meet a gala occasion is that the total jumps of all the participants put the SOCIETY ahead of where it was at last reports by one hundred and twenty members. The dizzy total now is 1918. Don't be mistaken. This is not a year, nor a time for the 220; it is the actual number of members now belonging to the AMERICAN CERAMIC SOCIETY.

NEW MEMBERS RECEIVED FROM JAN. 13, 1923 TO FEB. 10, 1923

ASSOCIATE

Adcock, Albert Scholl, 1999 Iuka Ave., Columbus, Ohio, Student Ceramic Engineering, O. S. U.

Arnold, Russell Ellsworth, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Ceramic Engineer.

Barnhart, Marion M., 225 W. Ohio Ave., Sebring, O., Gen. Supt. Limoges China Co.

Black, Thompson Wm., Oshawa, Ontario, Mgr. Ontario Potteries Co., Ltd.

Boyd, Robert C., Sigma Nu House, Ames, Iowa, Student.

Buck, L. M., Fort Ave. & Lawrence St., Baltimore, Md., Treas. The Buck Glass Co.,

Burket, Chester C., 1288 Nicholson Ave., Lakewood, Ohio, Secy. Cleveland Feldspar Co.

Burkhalter, Edward, 80 Thirteenth Ave., Columbus Ohio, Student.

Butman, Leo T., F. R. Muller & Co., Waukegan, Ill., Production & Factory Mgr.

Canfield, Ruth Ella, Instructor of Ceramics and Weaving, Carnegie Inst. of Technology, Pittsburgh, Pa.

Christman, H. M., 30 E. Frambes Ave., Columbus, Ohio, Student.

Cook, Herman L., 406 E. Healey St., Champaign, Ill., Student, Univ. of Illinois.

Cummings, John W., Box 16, Bath, Maine, Pres. & Treas. Mining & Grinding Feldspar.

DeVol, Arthur B., 34 Eighteenth Ave., Columbus, Ohio, Student.

DeVol, James Coleman, A-B Stove Co., Battle Creek, Mich., Supt. Enameling Division.

Dodge, Alfred W., Y. M. C. A., Zanesville, Ohio, Chemist, Kearns-Gorsuch Bottle Co.

Dorfner, Josef, Doktor Ingenieur, Meiningen y Thüringen (Deutschland) Direktor der Forschungs-Gesellschaft vereinigter Porzellanfabriken m.b.h.

Dunkin, Damon Duffield, Guion, Arkansas, Pres. & Gen. Mgr., Silica Products Co.

Dunwody, William Elliott, 460 Broadway, Macon, Georgia, Pres. Standard Brick Co.

Emmert, Edward, Des Moines, Iowa, Dist. Sales Manager, Walsh Fire Clay Products Co.

Gordon, Donald Dean, Wallaceburg, Ont., Mgr. Dominion Glass Co., Ltd., Wallaceburg Factory.

Gosnell, Jack, Washington Iron Works, Los Angeles, Calif., Charge of Mixing Room.

Gould, Robert E., 1927 Waldeck Ave., Columbus, Ohio, Student.

Hagar, I. D., 94 Fulton St., New York City, Buckman & Pritchard, Inc.

Hemsteger, Samuel E., 91 Sixteenth Ave., Columbus, Ohio, Student.

Higgins, Ray, 431 High St., Wadsworth, Ohio, Electrical Eng. Ohio Insulator Co., Barberton, Ohio.

Hobson, Mrs. George H., 126 High Street, Brookline, Mass.

Hottinger, Arnold H., 2525 Clybourn Ave., Chicago, Ill., Laboratory, Northwestern Terra Cotta Co.

Hughes, Walter M., 137 West 10th Ave., Columbus, Ohio, Student.

Jones, Edgar, 35 Rimbach Ave., Hammond, Ind.

Kautz, Karl M., 30 E. 8th Ave., Columbus, Ohio., Student in Ceramic Engineering O. S. U.

Kelsey, Victor V., 1026 Luttrell St., Knoxville, Tenn., Secy. Knox Porcelain Co.

King, John A., Box 744, Worcester, Mass., Refractory Salesman, Carborundum, Co., Perth Amboy, N. J.

Koch, Edward, 655 Underhill St., Louisville, Ky., Standard Sanitary Mfg. Co.

Lampert, Walter G., 108 E. McComb St., Belvidere, Ill., Supt Hercules Porcelain Co.

Leary, Earl F., 907 E. 75th St., Chicago, Ill., President, Pyrometer Engineering.

Leary, William H., 907 E. 75th St., Sec. & Treas., Pyrometer Engineering.

Lenchner, Theo., 720 Bessemer Bldg., Pittsburgh, Pa., Mgr. Vitrifiable Color Dept., Vitro Manufacturing Co.

Massey, Crawford, 98 Fourteenth Ave., Columbus, Ohio, Student.

Ochs, Arthur C., Springfield, Minnesota, A. C. Ochs Brick & Tile Co.

Pigott, Howard W., 5043 Walnut St., Philadelphia, Pa., Salesman, E. J. Lavino & Co.

Preston, Harold Herbert, East Liberty Y. M. C. A., Pittsburgh, Pa., J. W. Cruikshank Eng. Co.

Riviere, Georges, 98 Boulevard de Courcelles, Paris, Administrateur-Directeur de la Cie Gle de Construction de Fours.

Roy, Charles Smart, St. Helens, Forest View, Chingford, London, E. A., England, Chemical Technologist.

Smart, Richard Addison, 114 Colorado Ave., Detroit, Mich., Detroit Rep. American Refractories Co.

Totten, George Oakley, Jr., 808 Seventeenth St., Washington, D. C., Architect & Porcelain Manufacturer.

Watrous, Aida, Box 23, Groton, Conn., Instructor at Norwich Art School.

Weeden, Chas. H., Rear 1295 N. 4th St., Columbus, Ohio, Enamel Mfg.

Wehtje, Ernst, Bromölla, Sweden, Managing Director, Aktiebolaget Ifö Chamotte-Kaolinverk.

Wells, A. A., Newell, W. Va., Asst. Chemist, Research Dept., Homer-Laughlin China Co.

Westfeldt, Martha G., P. O. Box 5161 Station B., New Orleans, La.

Williams, Frederick H., 1927 Elmwood Ave., Buffalo, N. Y., Treas. and Gen. Mgr., Buffalo Porcelain Enameling Corp.

Williams, William George, 429 N. Lawler Ave., Chicago, Ill., Foreman, Enameling-mixing Dept., Coonley Mfg. Co., Cicero, Ill.

Wishnew, Alex., Y. M. C. A., Wheeling, W. Va., Ceramist, Wheeling Tile Co.

Wolfram, Harold George, 501 E. Daniel St., Champaign, Ill., Student, Univ. of Ill.

Zoller, Miles M., 208 So. LaSalle St., Chicago, Ill., Eagle Picher Lead Co.

Corporation

Abbé Engineering Co., Henry F. Kleinfeldt, Secy., 50 Church St., New York City.

Corning Glass Works, E. C. Sullivan, Corning, N. Y.

The Portsmouth Refractories Co., W. B. Hitchcock, Portsmouth, Ohio.

R. T. Vanderbilt Co., R. T. Vanderbilt, Pres., 50 East 42nd St., New York.

MEMBERS RECEIVED DURING PITTSBURGH CONVENTION

ASSOCIATE MEMBERS

Bacharach, Herman, 7000 Bennett St., Pittsburgh, Pa., Pres. Bacharach Ind. Instrument Co.

Baldauf, Earl E., 60 East Lane Ave., Columbus, Ohio.

Beckert, Carl J., 1842 Indianola Ave., Columbus, Ohio, D. A. Ebinger San. Mfg. Co.

Blom, O. W., Ethunac, Calif., Mine Supt.

Boeschenstein, Harold, Alton, Illinois, Secy.-Treas. & Mgr. Duval d'Adrian Chemical Co.

Bouton, Geo. I., 2926 Baldwin Ave., Detroit, Mich., Chief Eng. Murphy Furnace Co.

Brenner, R. F., Chemist, H. C. Fry Glass Co., Rochester, Pa.

Burgess, Wm., 30 Logan Ave., Todmorden, Ont.

Burlingame, Robert C., 614 Henry Ave., Wellsville, Ohio. McLain Fire Brick Co.

Cunningham, H. S., 3832 Eoff Street, Wheeling, W. Va.

Dalzell, W. F., 1204 Seventh St., Moundsville, W. Va., Chief Chemist, Fostoria Glass Co.

Denison, Geo. W., Cleveland, Ohio.

DeVaughn, Harry E., Morgantown, W. Va., Chief Engr., U. S. Window Glass Co.

Doyle, William Thomas, 128 North Wells St., Chicago, Ill. Pres. Terra Cotta Service Bureau.

Endler, A. H., 365½ W. Indiana Ave., Sebring, O. Supt. Strong Mfg. Co.

Everitt, F. C., 620 Riverside Ave., Trenton, N. J., Supervising Engr. Miller Franklin Basset & Co., 347 Madison Ave., New York City.

Fesler, Raymond T., 1943 Waldeck Ave., Columbus, Ohio.

Glenner, Francis R., 91 Chambers St., New York City, Mgr. Eastern Chem. Div. Lindsay Light Co.

Grainer, Russel J., 211 Mill St., Beaver Dam, Wis. Vitro Enameler, Malleable Iron Range Co., Beaver Dam, Wis.

Hardy, Wm. T., 285 South Water St., Milwaukee, Wis. Gen. Mgr. Luther Grinder Mfg. Co.

Hemphill, R. W., Colonial Insulator Co., Akron, Ohio.

Hitchins, Park, 1447 Oliver Bldg., Pittsburgh, Pa., Sales Representative United States Refractories Corp.

Hobert, Leroy F., Sandusky, Ohio, Secy.-Treas. The Universal Clay Products Co.

Hodek, F. E., Jr., 4101 Parker Ave., Chicago, Ill., General Porcelain Enameling & Mfg. Co.

Humpel, Frank, 1200 Fulton St., Grand Haven, Mich., Challenge Refrigerator Co.

Humphrey, A. F., Greensburg, Pa., Mgr. Keystone Clay Products Co.

Isherwood, John J., 6634 Northumberland St., Pittsburgh, Pa., Sales Rep., Eureka Fire Brick Co.

Jones, Emery Williamson, 1262 Ontario St., Cleveland, Ohio., Refractory Div. The Carborundum Co., Perth Amboy, N. J.

Lake, Charles C., Alfred, N. Y., Student, New York School of Ceramics.

Lano, C. A., Goldsboro, N. C., Gen. Supt., Borden Brick & Tile Co.

Lees, Arch. A., 1110 Franklin Ave., Wilkinsburg, Pa., Refractory Dept., Carborundum Co.

Lovett, C. H., Cook Pottery Co., Trenton, N. J., Secy., Cook Pottery Co.

Mackasek, Edward, Beaver Enameling Co., Ellwood City, Pa.

May, A. Largne, Secy.-Treas., Beaver Enameling Co., Ellwood City, Pa.

Mayer, C. P., Bridgeville, Pa., Pres., C. P. Mayer Brick Co.

Nicely, C. A., Watsontown, Pa., Supt., Watsontown Brick Co.

O'Hara, C. H., P. O. Box 776, East Liverpool, Ohio, Salesman, Roessler & Hasslacher Chemical Co.

Oldt, Guy H., Paxtonville, Pa., Supt., Paxton Brick Co.

Olsen, Rangwald Severn, 501 E. Daniel Street, Champaign, Ill.

Parker, Chas. W., 6830 Waterman Ave., St. Louis, Mo., Mgr., Walsh Fire Clay Products Co., St. Louis.

Parmelee, Clifford H., 430 Center St., Solvay, N. Y., Onondaga Pottery Co., Syracuse, N. Y.

Polk, Robert E., 435 Sixth Ave., Pittsburgh, Pa., Chief Industrial Engineer Gas & Elec. Public Utility.

Reed, Carl E., Lancaster, Ohio.

Robinson, W. M., Bolivar, Pa., Pres., Garfield Fire Clay Co.

Schott, Dr. Erich, Jenaer Glaswerk Schott & Gen., Jena, Germany.

Sharp, Edward, 4216 Hirsh St., Chicago, Ill., Edison Elec. Appl. Co.

Showers, Lee, Pittsburgh Plate Glass Co., Pittsburgh, Pa., Supt.

Smith, Louis A., Jones Laughlin Steel Corp., Aliquippa Works, Woodlawn, Pa., Supt. Coke Oven Dept.

Stewart, Mrs. Wm. Alvah, Thistlegate Farm, Coraopolis, Pa.

Swain, Roy E., Box 666, Charleroi, Pa., Engineering Dept., Macbeth-Evans Glass Co.

Trathowen, T., Chemist, B. F. Drakenfeld & Co., Washington, Pa.

Walrath, L. D., 1155 Main Street, Buffalo, N. Y., Mgr. Acme Shale Brick Co.

Walsh, N. S. Chouteau, 220 Fifth Ave., New York City, Treas., Walsh Fire Clay Products Co.

Worth, Geo. E., Rochester, N. Y., Manager, Genesee Feldspar Co., Inc.

CORPORATION

Straitsville Impervious Brick Co., New Straitsville, Ohio., John D. Martin, Mgr.

Associated Tile Manufacturers, Beaver Falls, Pa., F. W. Walker, Secretary.

Geijsbeek Engineering Co., Burke Bldg., Seattle, Wash., S. Geijsbeek, Pres.

Jewettville Clay Products Co., Inc., Jewettville, N. Y., H. S. Langworthy, Vice-Pres.

Mueller Mosaic Co., Trenton, N. J., H. C. Mueller.

Edward Orton, Jr., 1738 N. High St., Columbus, Ohio.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

P. S. Bachman, formerly of 92 W. Maynard Ave., Columbus, Ohio, is now located at 563 Market St., Wooster, Ohio.

C. E. Bales, Chemist of the Louisville Fire Brick Works, was recently elected President of the Louisville Section of the American Chemical Society.

Richard B. Carothers, Assistant Manager of the H. C. Spinks Clay Co., has moved to Puryear, Tenn., from Newport, Ky.

Conrad Dressler of the American Dressler Tunnel Kilns, Inc., has changed his address from 1740 East 12th St. to The Studio, 10915 Cedar Avenue, Cleveland, Ohio.

R. F. Ewing, formerly with the McLain Fire Brick Co. at Wellsville, Ohio, is now associated with the Globe Brick Co., E. Liverpool, Ohio.

Gerald Fitz-Gerald of Birmingham, England, informs us that he has accepted a position with the Maxon Furnace & Engineering Co., located at Muncie, Ind.

F. P. Hall with the U. S. Bureau of Standards, Washington, D. C., has moved from 630 Webster Ave. to 4717 Wisconsin Ave.

Max Meissner advises a change of address from Hoopeston, Ill., to 15200 Loomis Ave., Harvey, Ill.

Ichijo Mokiji of 165 Broadway, New York City, is now in Germany, care of the Japanese Consulate General.

Joseph K. Moore of 122 Waverly Place, New York City, announces his new location at Room 2602, 120 Broadway.

C. Nick Muessig, salesman for the B. F. Drakenfeld Co., Inc., has deserted his E. Liverpool, Ohio, address for 50 Murray St., New York, N. Y.

Henry Oesterle of Canandaigua, N. Y., is now connected with the Roesch Enamel Range Co., at Belleville, Ill.

George J. Openhym, a former student at the N. Y. State School of Clayworking & Ceramics, wishes to be addressed at 16 Woodland Place, White Plains, N. Y.

James G. Phillips of Piqua, Ohio, has recently moved to 116 S. Broadway, Middletown, Ohio.

David A. Raiff, Coshocton, Ohio, wants his mail addressed to 138 Park Ave.

Wallace C. Riddell has changed his address from Le Roy Avenue, Berkeley, Calif., to 2544 Buena Vista Way.

Oscar Scherer has moved from Columbus, Ohio, to 530 Oakdale Ave., Chicago, Ill.

Ramsay Skinner, Treas. of the Reeves and Skinner Mach. Co., St. Louis, Mo., notifies us of a change of address from 4471 Olive St., to 3458 Sidney St.

R. T. Stull recently of the Columbus Station, U. S. Bureau of Mines, is now located in Savannah, Ga., as Assistant Industrial Agent of the Central of Georgia Railroad Co.

B. T. Sweely has discontinued his services with the Cribben & Sexton Co. of Chicago, and is now associated with the Baltimore Enamel & Novelty Co., Box 34, Baltimore, Md.

R. S. Webb of the American Window Glass Co. at Belle Vernon, Pa., wishes to be addressed at Larimer P. O., Larimer, Pa.

OBITUARY

Lysle R. Kraus, Secretary of the Kraus Research Laboratories, Inc., died Tuesday, Feb. 6th, 1923 as the result of a railroad accident.

Mr. Kraus was born Nov. 21, 1893 at Cockeysville, Md., was graduated from Sparks Agricultural College in 1914, and was one of the founders of the Kraus Research Laboratories, Inc., and associated himself with the company in the capacity of Ceramic Engineer.

In the ceramic field, Mr. Kraus invented several processes for the plasticizing of clays and developed many bonding clays of exceptional values. His research work in refractories was very exhaustive—making many improvements over present day methods and producing several new refractory bases.

Mr. Kraus' sudden death will be felt as a severe loss in the ceramic field.

NOTES AND NEWS

PROBLEMS IN THE DETERMINATION OF PHYSICAL PROPERTIES

Research Problems for Theses

In preparing for publication the data on physical properties of chemical substances, the editorial staff of International Critical Tables will find from time to time that important physical properties of substances of technical and scientific importance are missing from the literature. As fast as we become aware of missing data of this character, it is our policy to formulate research problems covering such missing data and to endeavor to interest chemists and physicists in undertaking the necessary investigations to supply the required data.

Most of the research problems formulated in this way will be suitable for bachelors' or masters' theses and in a few instances topics sufficiently broad to be suitable for doctors' theses will also be available. Many of them will be suitable for experimental problems in the ordinary laboratory courses in physical chemistry and physics. Thus, for example, the laboratory experiment covering the determination of solubility might, to advantage, deal with substances whose solubility is needed but is unknown. The average of the determinations made by a class of students, while not as accurate and reliable as the determinations made by a skilled investigator, will nevertheless be very valuable when they constitute the only data available on the subject. Moreover, the average student will be more interested in a laboratory experiment the results of which are of actual value and worthy of publication than he would be in repeating for the nth time the measurement of a property of some system which has been measured many times before.

International Critical Tables will be glad to submit to interested instructors in universities and colleges lists of problems of this character and to advise as far as it can concerning suitable apparatus and methods of measurement. It may be possible also in some instances to secure moderate financial assistance to aid in the purchase of materials and apparatus for investigators interested in carrying out work of this character. The results of such work may be published by the investigator in any appropriate publication medium and they should also be reported in duplicate to the office of International Critical Tables on completion of the work.

A number of problems on the following subjects are available at the present date: Heats of combination; solid oxides; Fe compounds. Specific heats; brass; solid oxides; steels; oils and fats; petroleum products; metals; salts; Fe compounds; asphalts. Latent heats of fusion; brass; metals. Heat conductivity; steels. Latent heats of vaporization; petroleum products. Viscosities; industrial materials; solutions. Kinetics; rates of drying hydrolysis of industrial materials; catalysis; transpiration of moisture; biochemical. Strength; industrial materials. Thermal expansion; steels; Fe compounds. Freezing-point-solubility diagrams; salts; acids; metals in water; soaps. Boiling points; solutions. Solubility of gases; in molten metals; in water. Chemical equilibrium; dissociation pressures at 1600°C. Electrical conductivity; metals, refractories. Properties of colloidal systems; industrial materials. Vapor pressures; metals; solutions. Specific rotatory power; gliadin. Index of refraction; solids. Density; certain organic compounds; solutions. Flash points. Surface tensions; solutions.

INTERNATIONAL CRITICAL TABLES,
1701 Massachusetts Avenue, N. W.,
Washington, D. C.

DECEMBER 10, 1922

NEW REPORT ON OHIO CLAYS

The Geological Survey of Ohio under the direction of J. A. Bownocker in coöperation with the United States Bureau of Mines, Columbus Station, with R. T. Stull in charge, has a report nearly completed on the coal-formation or buff-burning clays of Ohio. In all 87 samples were tested; 28 from the Pottsville formation; 55 from the Allegheny; 2 from the Conemaugh; and 2 from the Monongahela. The range is from high-grade flint to low-grade plastic clays. The report includes a short history of the progress of the various branches of the ceramic industry as practised in Ohio; geological data regarding the extent and stratigraphy of each bed with a list of the factories using it, the physical properties of each sample by R. T. Stull, the complete chemical analysis of each sample by D. J. Demorest, and a microscopial examination of representative samples of each member by William J. McCaughey. The report will approximate 450 pages.

WILBUR STOUT

BUREAU OF STANDARDS PUBLICATIONS

TECHNOLOGIC PAPERS ON CERAMIC PRODUCTS ISSUED[1] BY BUREAU OF STANDARDS, WASHINGTON, D. C.

A[2]

10. The Melting Point of Fire Brick
31. Some Leadless Boro-silicate Glazes Maturing at about 1100°C
40. The Veritas Firing Rings
50. The Viscosity of Porcelain Bodies High in Feldspar
104. The Effect of Size of Grog in Fire Clay Bodies
105. Comparative Tests of Porcelain Laboratory Ware
111. The Compressive Strength of Large Brick Piers
120. Tests of Hollow Building Tile
124. Constitution and Microstructure of Silica Brick and Changes Involved through Repeated Burnings at High Temperatures
142. Materials and Methods Used in the Manufacture of Enameled Cast Iron Wares
144. Properties of American Bond Clays and their Use in Graphite Crucibles and Glass Pots
155. Cement for Spark Plug Electrodes
159. Porosity and Volume Changes of Clay Fire Bricks at Furnace Temperatures
196. High Fire Porcelain Glazes.

B[3]

7. Testing of Clay Refractories with Special Reference to their Load Carrying Abilities at Furnace Temperatures (15c)
21. The Dehydration of Clays (5c)
22. Effect of Overfiring upon the Structure of Clays (5c)
46. A Study of the Atterberg Plasticity Method (5c)
85. Manufacture and Properties of Sand-Lime Brick (5c)
107. Comparative Tests of Chemical Glassware (10c)
116. Silica Refractories—Factors Affecting their Quality and Methods of Testing the Raw Materials and Finished Ware (20c)
165. Enamels for Sheet Iron and Steel (15c)

[1] Issued April 6, 1922.

[2] Available for distribution by Bureau of Standards.

[3] For sale by Supt. of Documents, Government Printing Office, Washington, D. C. at prices given.

C[1]

1. Effect of Preliminary Heat Treatment upon the Drying of Clays
17. The Function of Time in the Vitrification of Clays
23. Technical Control of the Colloidal Matter of Clays
30. Viscosity of Porcelain Bodies
51. Use of Sodium Salts in the Purification of Clays and in the Casting Process
79. Properties of Some European Plastic Fire Clays
80. Constitution and Microstructure of Porcelain

Scientific Paper No. 212—Melting Point of Some Refractory Oxides.

CALENDAR OF CONVENTIONS

American Association of Flint and Lime Glass Mfrs.—April, 1923.
American Association of Ice & Refrigeration—Washington, D. C., probably March, 1923.
American Dental Trade Association—Spring Lake, N. J., June, 1923.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association, Southern Group—West Baden, Ind., November, 1923.
American Foundrymen's Association—Cleveland, Ohio, April 30–May 3, 1923.
American Gas Association—October, 1923.
American Hotel Association of United States and Canada—San Francisco, April, 1923.
American Society for Testing Materials—Place not determined, June, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.
Association of Scientific Apparatus Makers of the United States of America—Washington, D. C., April 20, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products Association—Chicago, Ill., Third Tuesday in each month.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
International Chamber of Commerce—Rome, Italy, Week of March 19, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Brass Manufacturers—March, 1923.
National Association of Manufacturers of Pressed and Blown Glassware—Pittsburgh, March 13, 1923.
National Association of Manufacturers of the United States—New York City, Week of May 14, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glass Manufacturers—Place and date not determined.
National Board of Fire Underwriters—New York, May 24, 1923.
National Bottle Manufacturers Association—Atlantic City, N. J., Last of April, 1923.
National Gas Appliance Manufacturers Exchange—Kansas City, Mo., May, 1923.
National Gas Association of America—Louisville, Ky., Spring, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
National Gas Association of America—Louisville, Ky., April 23–24, 1923.
Refractories Manufacturers' Association—March 21, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Southern Association of Stove Manufacturers—Louisville, Ky., March, 1923(?).
Stoker Manufacturers' Association—May or June, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

[1] Supply exhausted; can be consulted in libraries, list of which is given in Supplement No. 3 to Circular 24.

March, 1923 **The Journal of the American Ceramic Society** Vol. 6, No. 3

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Editorial Office, 230 Lord Hall, Ohio State University, Columbus, Ohio

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R. M. Howe, Mellon Institute, Pittsburgh, Pa.
B. E. Salisbury, Onondaga Pottery, Syracuse, N. Y.
R. R. Danielson, Beaver Enameling Co., Ellwood City, Pa.

Standing Committees, 1922–1923.

Research

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Paul E. Cox
A. V. Bleininger
and one from each Division

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EDITORIAL

INDIVIDUALISM IN ASSOCIATION ACTIVITIES

Its Responsibilities and Benefits

"American Individualism" by Herbert Hoover, a book of only seventy-two pages, is a wonderfully clean cut and timely message which every American should read. The New York Times says, "This little book deserves to rank, and doubtless will rank, among the few great formulations of American political theory." It bears much the same relation to the problems of the present and the future that the essays of Hamilton, Madison, Jay, and Noah Webster bore to the problems that occupied men's minds when the constitution was framed."

Individualism is the social, the spiritual, the economic and the political principle for which all peoples are striving. It finds a larger expression in American institutions than elsewhere and it is the foundation on which the American Ceramic Society is builded. Mr. Hoover says that the individualism of America

differs from all others because it embraces these great ideals: that while we build our society upon the attainment of the individual, we shall safeguard to every individual an equality of opportunity to take that position in the community to which his intelligence, character, ability and ambition entitle him; that we keep the social solution free from frozen strata of classes; that we shall stimulate effort of each individual to achievement; that through an enlarging sense of responsibility and understanding we shall assist him to this attainment; while he in turn must stand up to the emery wheel of competition.

This from the pen of Mr. Hoover is the only formula by which the AMERICAN CERAMIC SOCIETY or any association, trade, technical, scientific, social, political, or religious, can work out its appointed tasks. The reason for this emphasis on individualism in society affairs is given by Mr. Hoover in the following.

> The economic development of the past fifty years has lifted the general standard of comfort far beyond the dreams of our fore-fathers. The only road to further advance in the standard of living is by greater invention, greater elimination of waste, greater production and better distribution of commodities and services, for by increasing their ratio to our numbers and dividing them justly we each will have more of them.
>
> Today business organization is moving strongly toward coöperation. There are in the coöperative great hopes that we can even gain in individuality, equality of opportunity, and an enlarged field for initiative, and at the same time reduce many of the great wastes of overreckless competition in production and distribution. Coöperation in its current economic sense represents the initiative of self-interest blended with a sense of service, for nobody belongs to a coöperative who is not striving to sell his products or services for more or striving to buy from others for less or striving to make his income more secure. Their members are furnishing the capital for extension of their activities just as effectively as if they did it in corporate form and they are simply transferring the profit principle from joint return to individual return. Their only success lies where they eliminate waste either in production or distribution—and they can do neither if they destroy individual initiative. Indeed this phase of development of our individualism promises to become the dominant note of its 20th Century expansion. But it will thrive only in so far as it can construct leadership and a sense of service, and so long as it preserves the initiative and safeguards the individuality of its members.

Every member of trade and technical associations has the opportunity to profit from the experiences and service of their fellow members through organized collaboration in the solving of problems. If operated at one hundred percent efficiency each member of this SOCIETY would profit from the activities of the nineteen hundred and thirty-three other members. The efficiency of this as of every like organization is in direct ratio to the number of individual members who participate; it is dependent upon individual efforts.

No association will be successful unless its management reflects the interest of its members. The degree of this SOCIETY'S success in rendering service to the ceramic industries is dependent upon the service rendered by the members individually. It is on these fundamental principles that the officers and committeemen of the SOCIETY, of the Divisions, and of the Local Sections are working. They are not chosen to do solo parts; they are simply the leaders and agents chosen by the individual members, not as *representatives* in service, but as *leaders* in service.

The success attending the efforts of the officers and committeemen and of the Divisions is proportional to the *active* interest of the individual members. There would be no accumulation of knowledge, no abstracting of the world's literature, no pyramiding of fundamental scientific facts into

industrial practices unless the individual members contribute of their knowledge and time.

There can be no dominance of officers and committeemen in the affairs of a successful society; indeed there is no enduring incentive for one to dominate in a technical society. The guiding incentive of a chosen officer and committeeman should be none other than to render that service which he believes his predecessor and successor in office should render.

The AMERICAN CERAMIC SOCIETY has developed to its present strength and ability to serve because it has emphasized and rewarded individual services. It has allowed full scope to the development of individual ambitions and aspirations, providing the ways and means of acquiring knowledge and of gaining recognition. The SOCIETY offers equal opportunity to each to earn that position in ceramic circles to which his intelligence, character, ability and ambition entitle him, and the strength and character of the SOCIETY in the great service it is rendering is a composite of the character, intelligence, ability and ambition of the individual members in this organized service scheme.

This SOCIETY is a group of persons and corporations, each intent on the best welfare of self, who have learned that self is best served when unselfishly serving with others. Individualism in purpose, service and responsibilities is not sacrificed in any degree in the collective service of a group.

It is not the will of the officers but the will of the individual members that shall be done. It is essential, however, that each member realizes that his will can be done only through service. The *Journal* will be what the individual members will it to be. The satisfactory progress made by this SOCIETY during the past twenty-five years was due to unselfish services rendered by individuals many of whom sacrificed a great deal of time and energy but each of whom found that he served self best when serving others most, for service of one begets service of many. This principle of self service through service to others is now a precept in association work and those who serve are increasing in numbers and in enthusiasm for service.

We have before this emphasized decentralization of activities. We believe in this thoroughly. No officer can, with justice to the members, substitute for those who selected him as their leader. The AMERICAN CERAMIC SOCIETY is growing stronger day by day in service to the ceramic industries because of this decentralization of service responsibilities through Divisions and Committees to the individual members. We believe in individualism in association activities and have learned that benefits accrue to the individual in proportion to the responsibilities he assumes and to the services he renders.

PAPERS AND DISCUSSIONS

RESEARCH—ITS VALUE TO A MANUFACTURING EXECUTIVE[1]

By B. E. Salisbury

In an attempt to discuss this subject, I do not feel that I am going to bring before you anything you do not already know, or that has not before been ably presented, but rather to give you some thoughts that have come to me during the years that I have been interested in the application of research work to some of my own problems.

The last few decades have seen great changes in the manufacturing industry. We are in the era known as big business. Changes of method and management have necessarily occurred. In the history of manufacturing, as well as of other kinds of commercial activity, there has usually been a small beginning on the part of some one man. This man had an idea, possibly much in the nature of a dream or a hope. As time went on and his industry developed he associated with himself other men. There was not in those early days much, if any, organized scientific knowledge. Certain practices, as a result of costly and bitter experiences, came to be recognized as better than others, yet there was little scientific basis for supporting them, and even this was not of general knowledge. In some comparatively few cases such industries were successful and grew to larger proportions, but by far the greater number were failures.

Attracted by the success of these ventures, and not deterred by the failures, others attempted, and in the absence of general organized knowledge, worked in comparative ignorance, and went through these same costly and bitter experiences, some few to succeed, others to fail. So it has been going through all the long years.

As the successful business expanded it became impossible for one man to cope properly with the situation, and so others were gradually trained as helpers, but still there was little definite organized knowledge, and such as existed was carefully guarded by the founder, and those whom he was training. The master still kept his fingers on the situation.

The business continued to develop and expand, and soon came a time when the master could no longer keep in intimate touch with all the operations. There also began to dawn in his mind the fact that, though successful, the business was not on a sure foundation, and that his investment, as well as that of his associates, depended too largely upon his health and continued life. Some way had to be found to carry on after his usefulness came to an end. At the same time he doubtless began to realize the desirability of some definite information of a scientific nature, why certain methods and practices he had worked out were the best, and why others were not desirable; and, still another step, there probably came to

[1] Pittsburgh Meeting, Feb. 12, 1923.

his mind the idea that carefully organized and diligent study and experimentation might reveal methods and practices better than his own.

Being a very busy man, he realized that he could not himself conduct the necessary investigations along these lines without sacrificing time needed in the successful conduct of his enterprise. Consequently he selected some one with qualifications he considered necessary, and, with crude facilities, set him to work at this task. This is my picture of the genesis of the research laboratory.

Business continued to grow, and many of a like nature consolidated. Still the master mind was getting farther away from the details. It being necessary to keep in touch with the operations, the factories were carefully departmentalized, and simple records were started to give him a continuing picture of operations. Cost and efficiency studies were begun. And so today the manufacturing executive keeps in touch with his operations largely through his department heads and his examination of records and statistics. In many of the large industries this is done far away from the scene of operations, which are scattered throughout the country. Considerable time could profitably be consumed in the discussion of the effect of this development on the social structure, but it is not my purpose to go into that subject now.

Today, the progressive industries engaged in manufacturing articles of a nature that are not almost wholly pure fabrication, maintain expensive and well equipped research laboratories, with technically trained men who devote their whole time to investigation of the possibilities of a better product, the study of ways to reduce losses in manufacture, and the search for better and cheaper methods, and also, what is of great importance, the testing of materials, and the product in varying stages of manufacture, so as to make more certain a uniform result. There are some industries in which the producing units are not consolidated under one head, that engage in coöperative research, the extent of which would be beyond the financial ability of any one of the units. In some the technical and research men organize themselves into societies such as our own, and convene to compare notes, and to publish various researches and the conclusions therefrom. This information, being of a public nature, and exchangeable with similar studies on the part of like societies abroad, removes any excuse for starting a business under the handicaps endured by the pioneers. This tends to reduce the waste of effort and capital that would otherwise be experienced.

It is unnecessary to mention the great progress of industry in this country and abroad that has followed these research studies; the constantly improving products, the elimination of avoidable waste, the recovery of by-products and finding means of utilizing them, have combined to give us much of happiness and prosperity.

It is an easy matter to construct a laboratory, and equip it with all the necessary apparatus for chemical and physical research, but the personnel of the research staff is of the greatest importance. It seems to me that research men should above all other qualifications, necessary as they are, be those who are imbued with the idea of service to industry, who will recognize that the experienced men in the shop do know something after all, and that much can be learned from them, and who are in the laboratory to be of assistance to the shop and not to dictate to it. The utmost coöperation between the shop and laboratory force is vital; with it success can be attained, without it failure is inevitable. Therefore in my view the research staff should consist of real men first, and scientists afterwards. This is particularly so with those who in the course of their work come in contact with the shop forces; with others who do purely laboratory work it may not at the moment be so important, but they can never rise above routine work unless they are able to get along without friction with the shop men.

Upon continued and intensified research depends very largely the future of our industries, which are coming more and more into competition with foreign producers for the world's markets. Science applied to industry, coupled with an honest and intelligent labor policy, and high grade business management, will bring industrial success, compared with which, that we are now enjoying will, in future years, seem somewhat insignificant.

Most of the technical problems of the Ceramic Industry are extremely baffling. Difficulties may, and often do, persist for years, before a method is found to correct them. The executive must largely depend upon his laboratory to solve these problems.

One successful operator, when a difficulty arose, used to attack the problem simultaneously, from every conceivable angle. This assured quick results, but he did not know the cause or combination of causes that led to the difficulty; consequently, upon its recurrence, this program was again followed. Obviously, under this plan, no record could be made that would show to others the cause of the particular trouble.

I understand that Edison has done his work more by the process of elimination. I believe it was he who said that "Genius is more perspiration than inspiration." It is said that in his search for a substance that would intercept the X-ray, every known substance was tried until certain forms of natural crystalline zinc sulphide, and later, calcium tungstate, made the fluoroscope possible, and men were able to see bones and obstructions through the human flesh.

Attacking problems of research in this manner, and duplicating at will in the laboratory the effects desired, and also those that are to be avoided, clearly point the way toward the desired end. Careful notes can be made of such a method of attack, and these will show the present executive, or

his successor, the way to get certain effects, or to avoid or correct certain difficulties. This, therefore, puts the manufacturing operation in a technical industry somewhat under control, and safeguards the business.

In addition to its research work, the laboratory may be of great assistance to the purchasing department, in checking up, by physical or chemical examination, or both, the character and condition of the various materials and supplies daily received. This often points to the rejection of some particular lot of material as not being suitable, or according to specifications, and thus saves considerable manufacturing loss. It is highly important that every lot of material entering into the wares produced should, on receipt, be carefully examined and tested, to insure uniformity in the product. The executive must depend upon his laboratory for this work.

Occasionally it is desirable to examine the possibilities of the substitution of one material for another, either to reduce the cost, or to better the product. In order to proceed safely, long and tedious work is necessary, in order that, to gain some desired results, other qualities are not sacrificed. Notwithstanding long and careful laboratory work, it usually takes a shop demonstration on a large scale to insure final results. All of this may take months, or even years, to accomplish, but it is the price that must be paid for progress.

When the executive can delegate to his research staff all of these problems, and the staff and shop work in harmony, he can then devote practically his whole time to questions of finance, sales promotion, labor relations and business possibilities. If his business is large enough these lines of activity are delegated to competent officials, thus leaving him free to keep but a general oversight of the business of which he is the executive head, and allowing time for the planning of greater and better things.

Onondaga Pottery Co.
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THE ART OF MANUFACTURE AND THE MANUFACTURE OF ART[1]

By Charles F. Binns

In Alice in Wonderland, Humpty Dumpty says that when he makes a word do a lot of work, he always pays it extra. Under such an arrangement as this the word "Art" must be almost ready to retire on a competency and I, for one, wish it would. Few words have been used with a wider meaning and with less intelligence. The use has ranged from art pottery to tonsorial artist and I am not sure but that the second application is more pleasing than the first. The extensive use of the term makes it necessary to limit or define the sense in which it is to be under

[1] Pittsburgh Meeting, Feb. 12, 1923.

stood. We are not speaking of the Fine Arts, Painting, Sculpture and Architecture, nor of the Arts and Crafts with their connotation of dilettantism and bric-à-brac. Rather let us think of art as expressing the applied skill of the conscientious worker whether in plastic form, color or line, for it is in these that the ceramic worker expresses himself and makes his appeal for understanding and acceptance. It will not do to fool ourselves and imagine that we possess that which in fact we have not. No progress can be made unless the true condition is realized and candidly faced. We Americans like to believe that we can do anything that any other people can do but this is not always true. We are still confronted by large importations of wares which, rightly or wrongly, are esteemed by the purchasing public as being of higher quality than the domestic product. We must therefore ask ourselves, and must insist upon straightforward answers, first, whether we are manufacturing wares which are in fact equal to these, that is, whether the alleged superiority of imported wares is imaginary or real, and, second, whether we are really interested in producing such wares or are content to go on as we now are, admitting the superiority of the foreign goods but willing to admit it and satisfied if only we can sell, if not an inferior, yet a less ambitious product by the car load.

I do not intend to discuss the strictly decorative wares or tile or scheme goods or anything but the regular table wares of the household. As the matter now stands, we are manufacturing enormous quantities of general ware which is for the most part decorated as open stock patterns. This idea has a potent charm for the manufacturer and the dealer. It has its conveniences also for the consumer who can at any time replace losses without difficulty but it does not make for the excellence which resides in individuality. It affords but little opportunity for the expression of personality in design and denies a place to the fine quality which appeals to the discriminating purchaser. The production of open stock patterns may and probably does present the simplest and most profitable plan for running a large manufactory but the unfortunate result is that it predetermines and stereotypes methods so that the introduction of anything different, even if superior, becomes, if not impossible, exceedingly inconvenient. Let me not be understood as condemning the open stock pattern. There is no reason whatever why good designs should not be set forth in this way and there are good open stock patterns both domestic and imported on the market. The point of my criticism lies in the acceptance of mass production as the most desirable and even the only profitable plan. It lays stress upon convenience and economy rather than upon quality and yet it should be made clear that a good design does not necessarily cost more to reproduce than a bad one.

If my observation has been correct and representative, it tends to show that very few of those who are charged with the production of decorations

have had any training in the principles of design. Indeed very many patterns speak for themselves. They do not satisfy a discriminating taste. Of course, the answer may be that they are not meant to; they are produced for the multitude and must be inexpensive so that the multitude may buy largely. That may be all right if this is our only aim, except that there is discriminating taste even in the multitude, but if we have no other purpose we must not cavil at imported wares.

In opposition it may be argued that the possibility of purchasing abundant supplies of decalcomania prints has relieved the manufacturer from the necessity of employing a designer, but as a matter of fact, the offering of these prints has placed or should place the burden of selective taste upon the buyer or purchasing agent. Too often, apparently, designs are prepared and prints selected for no other reason than that they can be used by the transferrer equally well on every shape and without calling for any skill except a rapid and dexterous fingering. As a matter of fact, we have forsaken the art of manufacture and have become ensnared by the subtle wiles of the manufacture of art.

But art is essentially individual. If it means anything at all it means the expression of an idea, and mass production tends to destroy this. The criterion of fine workmanship is merged in the satisfaction of the manufacturer in seeing that his wares in their passage through the workrooms are all going one way.

If the truth must be told, we have become impatient of taking pains. We are devoted to automatic machinery and the more nearly our employees approach automata the better we are pleased. To some of us the ideal method of making dishes would be a series of endless belts, the work people in long rows each adding a touch to the passing pieces until they are delivered complete to a continuous kiln and from this to the packer.

I am fully aware that the producer of these wares denies that he has any mandate to educate the public and as long as his product finds a ready market he is satisfied. But we cannot remain indefinitely under the protection of a high tariff. Sooner or later we will be compelled to market our wares upon merit and without fear of foreign competition and we shall be wise if we take counsel and look ahead. The Art Division of this Society believes in preparedness. It aims at placing in every manufactory some person, man or woman, who has undergone a regular training in design and the harmony of color, who is able to judge between good and bad workmanship, who has authority to decide upon the production and selection of decorations, and whose aim is the establishment of the product upon a plane which will reflect credit upon the producer and will appeal to the discrimination of the purchaser.

Two objections, more or less valid, may be advanced against this course: first, a person placed in such a position would probably, in our democratic

passion for titles, be styled Art Director and would be classed as a non-producer, and, second, in consequence of this the expense would be considered as an addition to overhead. Without presuming to dictate to the management of any plant I think we are wrong in regarding a designer as a non-producer and one who selects designs must be at least a potential designer. And further, there is no reason why such a person should not actually produce designs, to be wrought out, if the factory has no department of lithography, by a commercial house. This plan would also have the advantage of providing exclusive decorations. There is a conspicuous lack of individuality in our table wares. Each important European factory has a style of its own and it is not difficult to recognize its product but I do not think that this can be said of us. Back of this there is the important factor of esprit de corps and pride of product. The whole staff should work together in attaining and maintaining an ideal but this is only possible where there is a controlling mind trained to discriminate and to advise. It has of course occurred to you already that persons trained for such work are not at present available and I regret to admit that this is to a large extent true but once let it be known that there is a demand for them and there is no doubt that the supply will be forthcoming. It is of course necessary that anyone undertaking this work should be familiar with the methods of production. This has so far seemed to be the imperative thing that in nearly every case where a superintendent of decoration has been employed the choice has fallen upon a member of the decorating staff. If this is to be the accepted method the person so chosen should be sent to an established school for a thorough course in drawing and design but I venture to think that it is easier to drill a trained designer in the technique of the factory than to teach the sound principles of design to one who has learned his trade at the bench. As I do not want to present a one-sided discussion I will state the opposite view that one who has been brought up in the atmosphere of the workroom can be and usually is selected because of a certain power in dealing with other workers. This is a very important qualification and is difficult but I think not impossible to acquire.

I am not expecting that these ideas will be received with enthusiasm nor that immediate results can be secured. I am trying to look ahead and I ask you to share the vision. There does not seem to be any good reason why a given manufacturer should not select one or two promising young persons and provide for them the necessary training. There are probably local schools of design to which such persons could be sent or if not, it would surely be possible for manufacturers to combine to organize such a school. I recall the potent influence which has been exercised by the Burslem Art School in Staffordshire and by the Lambeth School upon the Doulton Wares.

The whole matter harks back to the question with which we began our discussion. Do we care? Are we satisfied? If the Art Division means anything at all it means that the SOCIETY which gave it birth and which is endeavoring to foster it, believes that it has a part to play and that part can be nothing else than to stimulate and promote the development and, if necessary, the improvement of our product.

It should be feasible for anyone in control of a properly equipped manufactory to create a small department for the express purpose of producing fine wares. Even without any change in body, glaze or fire a great deal could be done and when the first step was taken numerous possibilities would present themselves. It is not likely that such a venture would at first be profitable in cash but it might be made the means of establishing a reputation and anyway it would afford a whole lot of fun. "Oh, well," you say, "we are not in business for fun; we would not be here at all if we did not make money." But I say to you that the man who sticks in his office only long enough to make money enough to have time enough to get away to the country club to play golf is not the successful man. He says in effect, "this job of mine is not a life, it is only a living. If I can make it profitable I will get my fun outside of it." The fact is that if a man does not get any fun out of his daily work he should hunt another job, for the life is more than meat.

We cannot stand still and I repeat that we must not deceive ourselves by the bold advertisement of an advance which is only imaginary. Judging ourselves by ourselves and comparing ourselves among ourselves is no more wise in manufacture than in behavior. Let us at least select the very best examples that can be procured and set them before our operatives, not to be copied but as an illustration of the qualities which are acknowledged to be of the highest class and to which we hope and expect to attain.

NEW YORK STATE SCHOOL OF CLAYWORKING AND CERAMICS
ALFRED, NEW YORK

RELATION OF THE ART DIVISION TO THE OTHER DIVISIONS[1]

BY FREDERICK H. RHEAD

It is impossible to discuss the present and potential possibilities of the Art Division without considering its relation, duties and obligations to the other Divisions.

We limit these possibilities to the extent that we fail to recognize our relationship with the various ceramic activities which include in their organizations one or more of the many types of art or craft specialists.

An interest in a particular Division need not and should not become so detached that its program tends to become the concern of one particular

[1] Art Division, Pittsburgh Meeting, Feb. 13, 1923.

group of specialists to the exclusion of other groups who are more or less involved in the general scheme of production.

The complexities of ceramic work are such that no one group—however well informed and well equipped it may be—can tackle with the full possibility of successful accomplishment its own particular problems without finding itself on ground outside its own range of investigation or research. For instance, the manufacturer of chemical porcelain finds himself immediately concerned with refractories and possibly heavy clay products.

His problems of design, shape construction, modeling and mold construction would be worked out by specialists following the activities of the Art Division.

The manufacturer of architectural faience and terra cotta is, or should be, intimately concerned with the artistic quality of his product—a quality, by the way, which is emphasized or diminished according to the intelligent degree of censorship or direction given to the execution of the work during the planning, modeling, moldmaking, clay-working, selection of color and general technique. A good original design is of course an essential, but a good original design may be altogether ruined by lack of competent direction or execution during any stage of the work.

Competent direction and execution of ornamental or decorated wares of any description are only possible when competent directors and productive specialists are being used, and it is equally obvious that such specialists besides following their own field of research and investigation should in a general way keep well informed of the practical and technical developments in the various fields.

On the other hand, the practical and technical specialists should realize that the decorative specialist is an equally essential productive force possessing a potential field of investigation just as great as that of the practical and technical field.

The Art Division is organized in the interest of artistic and decorative development. The field of research covers shape construction, design, decoration, color development, modeling, moldmaking, applied decoration in various forms, the mechanical decorative processes such as decalcomania, printing, stenciling, etc. These methods may be invented or developed by the practical or technical man, but they must be used with some appreciable amount of artistic expression if truly artistic wares are to result.

The practical activities of the ceramic art specialist cover a wide field, much wider than is generally recognized. Even in a single plant producing one type of ware, there may easily be from three to six men each engaged in a different class of work. Take the average whiteware plant, for instance. There is, or should be, the Art Director, or the man who is responsible for the designs and decorations. There is the modeler, re-

sponsible for the models and relief ornament. There are the painters and decorators. In the English plants where there is still some printing, involving copper plate engravers, there are also the people who do the mechanical decorating, decalcomania; and the gilders, all specialized help, and all doing an entirely different class of work than the specialists working in an art pottery, tile, faience or terra cotta plant.

A designer of table wares may have only the most superficial knowledge of architectural styles, but he must know historic ornament, and he must be able to make highly finished and daintily executed decorations that will be acceptable to the best artistic judgment of the day. If he is called upon to make a design for a plate border in Italian Renaissance, the design must be Italian Renaissance and not a mongrel concoction plainly showing his own ignorance, and advertising his concern to everybody initiated in art as a concern possessing no artistic influence or ideals.

There are manufacturers who may retort that they are not interested in artistic productions, but in popular sales; or in other words, so long as there is no particular public censorship in regard to mediocre design and badly executed decorations, mediocre designs and badly executed decorations will be the rule rather than the exception. But as every business man knows, what will sell today may not sell tomorrow. Just as the manufacturers are learning more about the possibilities in business, so is the general public learning more about quality and style. Even the manufacturer who will not cater to those who know good design admit that there is such a thing as a change of fashion, and that a design that was popular ten years ago may not sell today.

This means that there is definitely such a thing or force as public opinion in such matters, and also that this public opinion does influence the manufacturer to the extent that he changes his decorations every little while. As this public opinion becomes more discriminative, the manufacturer either makes a better product or limits his market to that public which is not so discerning in taste.

The standards of artistic quality do not concern the manufacturer of products alone. They concern the business and domestic life of the nation. We are more interested in Art, or if you prefer, good-looking products than we were twenty years ago. Art and decoration is now being taught in the schools at a cost of some millions of dollars a year. Both the manufacturers and the employees are paying taxes to teach the younger generation an appreciation of art with the result that this younger generation will be educated to the degree where it is likely to turn up its nose at our own wares and buy European and even Japanese productions.

To the manufacturer who retorts that his particular product is selling, one can only reply to the effect that his foreign competitors' product is

selling also, and that a considerable portion of the purchasing public prefers this foreign product to the domestic ware.

For instance, according to a recent industrial report, the foreign imported decorated china ware displaced the domestic product to the extent of about $18,000,000.

We have made such strides in practical and technical clayworking that this preference is not based upon practical and technical excellence. It is based largely on the general appearance of the ware; not entirely, because many purchasers are taught to believe that a foreign article is superior to our own. A dinner service that is known to be French china has an appeal and a sales value that an American china has not yet earned.

But there are many signs by which the progressive manufacturer may gauge the coming popular taste; and these are signs that he can easily recognize. I have mentioned art training in the public schools. The consequent results are obvious. While we are considering the education of the public, let us glance through the pages of a popular weekly magazine. Note the advertisements for American manufactured products. Hundreds of thousands of dollars are spent every year for decorative advertisements for products which in themselves are neither decorative nor artistic. Tobacco is not an artistic product, yet one concern will pay from two to five thousand dollars for a painting or drawing to be used as an advertisement. Soap is not an artistic product, yet within the last ten years, one of the largest soap factories in the world has developed its business by means of its publicity campaigns in which it used carefully designed decorative advertisements.

If a cleverly planned artistic appeal will sell tobacco, soap, etc., it is surely obvious that such products as table wares and other decorated potteries will have a wider appeal and market, if the designs and decorations are planned and executed by competent decorative specialists. A condition where a soap manufacturer will pay from two to twenty thousand dollars for a drawing or painting for advertising purposes, while a manufacturer of art products will balk at an expenditure of fifty dollars for the actual design for a dinner service, re-acts in favor of the soap manufacturer.

The sausage and soap manufacturer go abroad in their million dollar yachts, while the pottery manufacturer stays at home with his nose to the grindstone, and he is lucky if he can escape his desk to the extent of a dozen games of golf in a year.

Even the moving picture industry with its present tremendous popular appeal is paying an enormous salary to an individual, who is engaged simply and purely to raise the standard of the product.

These ideas are not original, and they are not new. They have frequently been more or less forcibly expressed by various prominent Ameri-

can manufacturers of general ware, and further, enough good work has been done within the past ten years to demonstrate the fact that the American potters can produce wares of good design.

But if it requires a Coles Philips, a Maxfield Parrish and a Leyendecker to make designs that will sell soap, tobacco and sausage, then you may be quite sure that it will take an artist equally gifted and skilful to make designs that will sell crockery. And when you do realize this, you will find that your products will have as big a sale as some of the nationally advertised wares.

It is well to bear in mind that it costs as much to reproduce a bad design as it does a good one. And further, the general ware manufacturer is in a much more favorable position than is the art potter and the tile and terra cotta manufacturer. General wares are mechanically decorated. The artistic quality of general ware depends almost altogether on the quality of the original design for the shape and decoration.

If this is good, the resulting product is artistically acceptable, but if the design is bad or not acceptable to the best artistic taste, no amount of technical or practical excellence will make that product acceptable. And again, if the manufacturer is willing to test the market with an acceptable design, he does not have to wait for the much needed industrial art schools plus the five or ten years involved in training designers. We have the best designers in the world today, but these men are engaged, as stated, in the other industries. While the general ware manufacturer may not be able to pay the salary demanded by some of these designers, he at least can pay what would be considered a reasonable price for a first-class design, especially as this first cost is the final cost as far as the quality of the decoration is concerned.

In discussing this question I would like it to be clearly understood that I do not advocate any new or radical change in the present style or arrangement of general ware design. A clever designer can take any artistic "best seller" and make it over in such a way that the uncultivated critic would not recognize the change, while a person who knows a good design would distinguish the difference at a glance. The result of such a procedure would be to include as prospective purchasers not only those who are unable to recognize the fine qualities in decoration, but also those who do. Or in other words, the clever designer is much better equipped to appeal to those who do not understand design than the unskilful designer, while the latter can never hope to interest the ever-increasing number of people who do possess good taste.

To put the case in yet another way, the popular market, so-called, is, as stated, becoming more fastidious. It is both able to recognize and demand better designed clothes, furniture, jewels, moving pictures and automobiles. Even Henry Ford is once in a while compelled to improve

the appearance of his "Tin-Lizzie" if he is to hold his market. So it is, I think, reasonable to assume that the manufacturer who makes a business of producing decorated wares will before long produce wares that will seriously compete with European products.

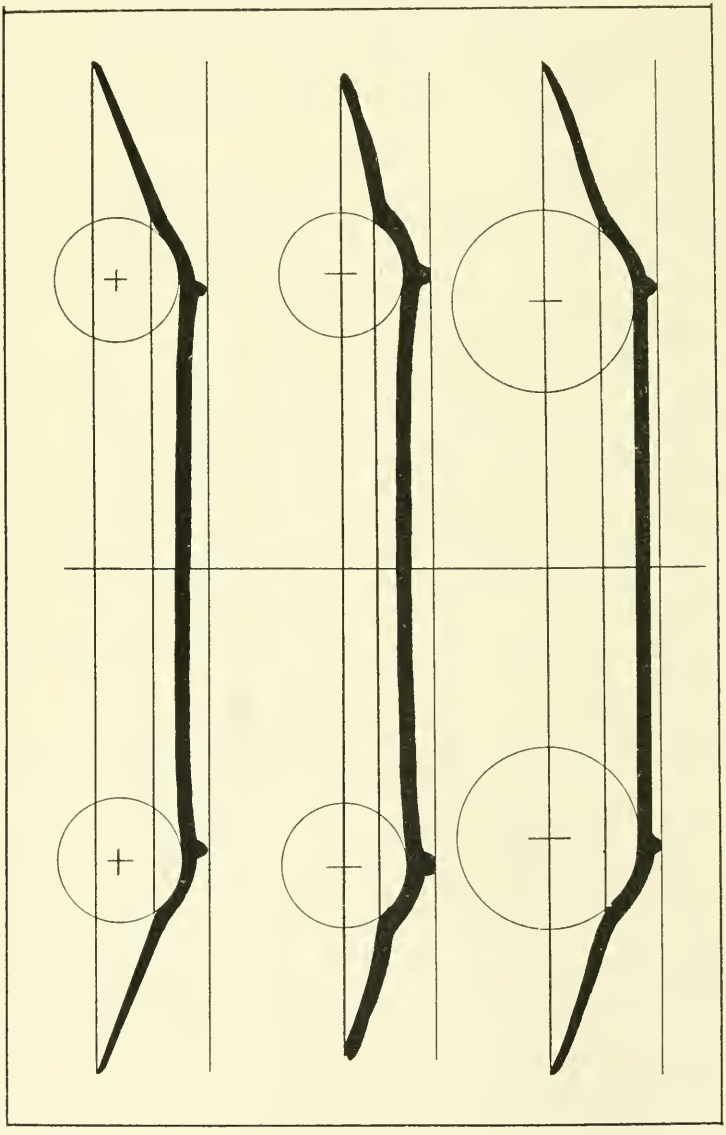

FIG. 1.—Sections of plates measured from actual examples. The finished shape is seldom, if ever, absolutely under the control of the designer or modeler, because it is always subject to a variation both in regard to size and shape, which in the absence of a properly defined specification and variation allowance cannot be accurately estimated.

While there has been considerable research work in connection with the technical branches of general ware practice, there has to my knowledge been little or no real research in either shape construction or decoration.

It is even quite possible that few manufacturers and even ceramic designers know what such research involves.

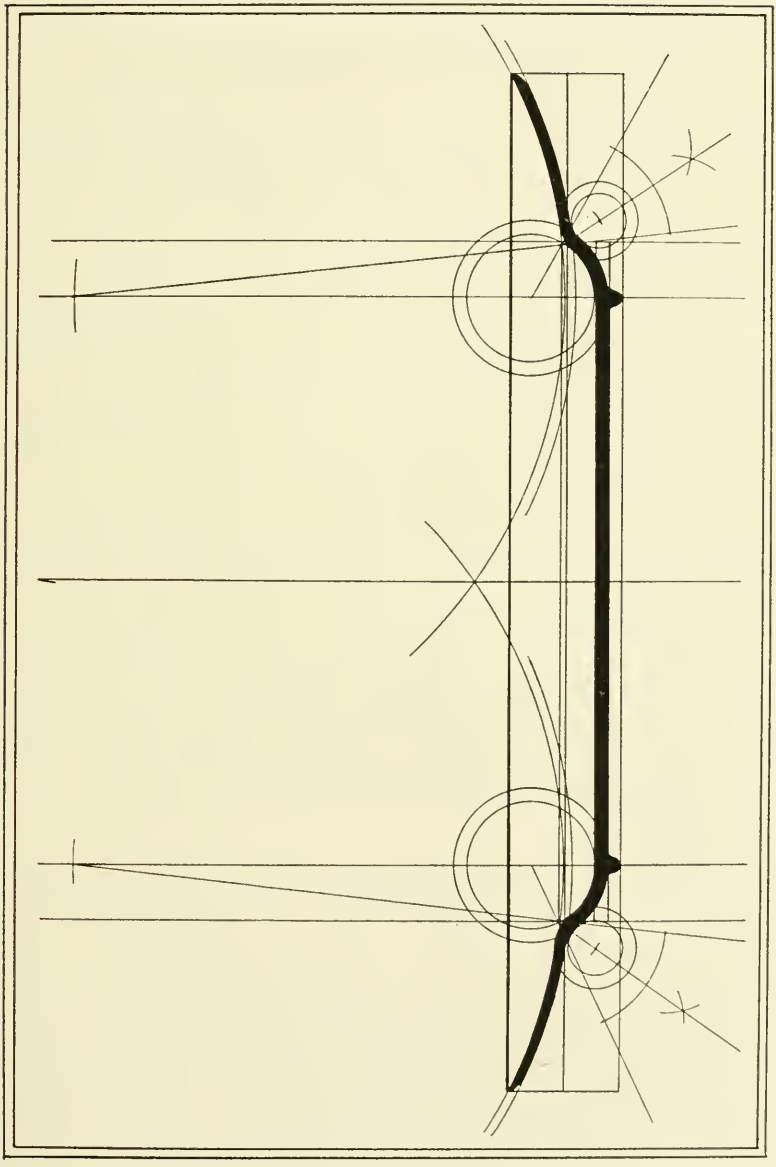

Fig. 2.—Plate section based upon a definite measurable construction. If a section of the finished plate be measured and checked up with this working drawing, the exact degree of variation can be determined, supplying data which would contribute to a more accurate shape control.

For instance, take the average nine-inch dinner plate. Consider shape construction first. Aside from the general appearance of a nine-inch plate, how many manufacturers and shape designers know whether the base of

the plate should be five, four, or six inches; or the most practical height and width of the foot of the base?

What investigation has been made to determine whether the body of the plate inside the rim should be modeled exactly flat, or if not, just what degree of concavity or convexity should be adopted to prevent the inside of the plate from rising or sinking in the middle while it is being fired?

Just what is considered to be the most desirable width for the rim of the plate and the most acceptable height of the rim from the base? In those plates which are placed flat in the sagger, how much is allowed for the settling or dropping for rims of various width and height?

I am speaking from a purely practical point of view with some consideration of the preventable losses due to warping, etc.

Has there ever been a systematic study of sections of plates made by the factories of various countries, and is there a general ware plant in this country where such an investigation has been worked out?

In those factories producing vitreous or feldspathic porcelain, I believe such an investigation would result in determining a plate construction which would minimize warping during the drying and firing.

So far as mold construction is concerned, this branch of the activity is generally left to the judgment of the modeler and mold-maker, and it is a question if there has ever been a serious systematic study to determine the most suitable thickness, shape and type of molds for various articles to be cast, pressed or jiggered. I do know of one or two isolated instances where the standardization of thickness of the mold for articles of various sizes has resulted in the saving of carloads of plaster, and also in increased shop efficiency. In addition, a large waste of plaster has been practically eliminated by the simple means of providing the mold-makers with a round or square iron frame into which surplus plaster has been poured to be used for setters.

There is little doubt that increased efficiency and a big saving of plaster would result if well planned working drawings or blue prints were used by both modeler and mold-maker. For by this means the model could be closely checked up before it was turned over to the mold-maker and the exact method of mold-making would be established and controlled. Then there is the research work covering investigation in connection with the decoration of the plate. Assuming that a standardized nine-inch dinner plate had a one and three quarter-inch rim, and that the curve to the inside of the plate was based on a one-inch radius. This would leave approximately five inches for the center of the plate, so the available field for decorative purposes consists of a circular border nine inches in diameter and one and three quarter inches wide; a narrow curved circular border, and a flat circular space in the center of the plate five inches in diameter.

Considering the possible decorative arrangements, we find the following combinations:

1. A flat circular panel five inches in diameter surrounded by a narrow frame or border and a wider border occupying the entire rim of the plate.

2. A flat circular panel five inches in diameter surrounded by a narrow frame or border, but with no border on the rim other than the gilt or colored edge.

3. No decoration in the center of the plate, a border covering the entire rim framed by a narrower border arranged around the inside of the curve.

4. A border occupying the entire rim of the plate, but no decoration around the curve or in the center of the plate.

5. A border occupying less than the available space on the rim of the plate.

While those quoted are the possible arrangements, the majority of present day dinner ware designs consist of a border occupying all or a portion of the outer rim of the plate.

In considering the possible decorative motive, we have two broad groups:

First, naturalistic decorations of floral and other natural forms arranged and interpreted much as they appear in nature, and secondly, conventional decorations, or natural forms converted into ornament more or less abstract or symbolic in style. As each country and period developed its own individual style, we have at our disposal a wide range of distinctive historic and modern decorative types, the most notable, or at least the most used, being possibly the Grecian, Italian and Chinese. The Persian, Japanese and French have also been prolific sources of inspiration.

The modern designer, however, has struggled to develop a style that is entirely original, but with no particular result to date except the more or less mongrel interpretations which can easily be traced to their original sources. This is not the place to analyze the various types and styles of ornaments. It is only necessary to state that the competent designer must know these types, and that each progressive plant should have filed for reference purposes either good reproductions or actual examples of these various types or styles.

As fashion changes, and as there is evidence of the coming of a particular fashion or style, the manufacturer or the designer can select one or more decorative styles for his new productions. In gauging the possibility of future markets, these defined conditions should be closely observed.

Often these are neglected for more superficial signs. For instance, the manufacturer will take close cognizance of new importations and try as closely as possible to follow them.

Would it not be a more rational method for the manufacturer to follow closely the prevailing decorative styles in other industries? The textile,

wall paper, carpet and furniture interests through their big industrial exhibitions define to a great extent what the coming popular style will be. The various fashion magazines are valuable sources of information. Certain authentic decorative types are always more or less marketable, but there is generally a predominating style and color which appeals for a period of a year or so to a great popular market. Consequently an approximate estimate of this condition is pretty sure to result in a popular seller, which is what we are all after.

But the point I am trying to make in connection with the decorative research is this, that unless a chief designer or art director is constantly investigating these conditions, collecting authentic examples or reproductions of examples properly classified and filed with data covering costs, markets reached, sales, etc., and supplementing this data with carefully worked out drawings based upon the present acceptable space combinations given, he will never be any better able to interpret the market than he is now.

The efficient art director should not only be concerned with the production of half a dozen or so different patterns a year, a group selected say from twelve to twenty designs, but he should have scores and hundreds of research or development drawings, showing variations of different acceptable styles. To an expert designer, the making of an actual drawing is but a matter of an hour or so. The most finished design for a dinner plate can be made in about half a day. So far as the actual drawing is concerned, little labor is involved. But this finished design may be the final development of hundreds of previous sketches.

The trouble with most of our ceramic designers is that they do not draw enough. When only a dozen or so sketches a year are asked for, a drawing begins to assume the proportions of an undertaking instead of a casual incident in the course of a week's work, and the designer, because of his lack of practice, does not acquire the facility of execution, or knowledge of the historic styles that are the stock in trade of the commercial designer in other fields.

A plate design seems a simple undertaking, but assuming that both the shape and design are finally developed, there are a hundred possible color schemes, even if only two or three colors are to be used. While a simple border may not show the amount of work involved, a perfectly designed plate with a well balanced color scheme may easily be the result of work covering a period of time of a year or more.

Consider the amount of work involved in connection with the development of a single body and glaze, and then consider how little true research work is done in connection with decoration and color arrangement.

The Art Division is definitely interested in design and decoration in relation to the general ware industry, and in addition, in constructive

criticism such as is here offered with due respect for the problem and the conditions involved. We hope to arouse the interest of the whiteware manufacturers to the extent that we can present contributions to the *Journal* covering various phases of decoration and shape construction development.

I am conscious that many of the points raised in this paper require further elucidation and elaboration, and when the opportunity offers, this will be done.

At this time it is enough to state that the Art Division realizes and recognizes the need for important constructive work in the interest of the whiteware industry.

This recognition extends also to other branches in the ceramic field. We have a rapidly increasing market for art, tile, faience and terra cotta wares of a class that will compare favorably with the best work in marble and bronze. And within a few years at most the work of the potter will be exhibited side by side with the work of the great artists of the country.

But we cannot expect this privilege or the increased business that will result from such an advance until our draftsmen, artists, craftsmen, decorators and modelers are properly equipped and efficiently directed. And in regard to the latter, the direction does not involve only the active head of the department, it involves the manufacturer himself, or the business head of the organization. It is not, of course, necessary that the manufacturer or general manager be a decorative process man. But it is essential that he has an appreciation both for the finished product and the difficulties involved in its production.

As previously stated, there is a wider field for investigation in connection with art wares, tile, faience and terra cotta than in the white utility wares, because there is a wider range of decorative processes and a larger practical field. For this reason, the Art Division is interested in such activities as:

1. Industrial schools.
2. Practical clayworking processes relating to various types of ceramic ware.
3. Draftsmanship in connection with shape construction.
4. The ornament and architectural styles of various countries and periods.
5. Ceramic design.
6. Decorative ceramic processes.
7. Color standardization.
8. Supervision and direction in educational and industrial ceramic art activities.
9. Educational programs as outlined by Mr. Boudreau.

To mention but a few broad subjects of vital concern to many of those interested in the other Divisions.

Life is so short and the complexities and intricacies of ceramic work so involved that no one person can ever hope to know but little about it. For this reason, if for no other, those who can in any way contribute to our present knowledge should do so, not only because they add to the fund of total experience, but also because they themselves will benefit by participating in the general development.

American Encaustic Tiling Co.
Zanesville, Ohio

HISTORICAL SKETCH OF THE MANUFACTURE OF PLATE GLASS IN AMERICA[1]

By C. E. Fulton

In a brief history of the plate glass industry such as this, it will only be possible to describe the early attempts at plate glass manufacture and touch upon the outstanding developments which have been achieved.

The first attempt to introduce the industry was at Cheshire, Massachusetts, in 1850. This plant was later removed to Brooklyn, New York, but the company soon failed. In 1865, Theodore and James Roosevelt of New York formed the National Plate Glass Company and erected a plant at Lennox, Massachusetts. Machinery was brought from England, and although for a while this Company was more successful than the first organization, it also met with disaster and was discontinued in 1871. After this date further attempts to establish the industry in this country are connected with Captain John B. Ford, and a brief biography of Captain Ford and his various enterprises will be of interest.

He has been termed the "Father of the Plate Glass Industry in America," and when it is realized that he was the first to make a satisfactory product in this country at New Albany, Indiana, and the first to put the industry on a paying basis at Creighton, Pennsylvania, he is rightly deserving of this title.

He was born November 11, 1811, in Danville, Kentucky, and before engaging in the manufacture of plate glass had an interest in a number of diversified industries. The management of a store, manufacture of safes, saddle-making on a large scale, building steam boats, commanding Ohio River steamers, and an attempt to make glass sewer pipes were some of the activities of this versatile man.

At the age of 58 he became interested in the manufacture of plate glass, and, after studying the methods used in the previous efforts in America and the methods relative to European practice, Captain Ford with his brother-in-law, Washington Irving DePauw, built a factory at New Albany,

[1] Received Feb. 27, 1923.

Indiana, in 1870. As in the earlier attempts, the machinery was purchased in Europe, but before it arrived the buildings were destroyed by fire. Undiscouraged, new and larger buildings were erected to take their place, and New Albany has the distinction of being the first place in America where a satisfactory quality of plate glass was made. This venture met with some success, but in the language of the census report for 1880 "it had to undergo the reverses that seem the fate of all plate glass houses in this country." A second factory was erected by Captain Ford at Louisville, Kentucky, in 1873, and a third at Jeffersonville, Indiana, about 1875. A fairly satisfactory quality of glass was produced but they also failed after operating for a few years.

Before continuing with Captain Ford's efforts, it should be stated that the American Plate Glass Company was organized in 1876 and a plant erected at Crystal City, Missouri. One year later the corporate name was changed to the Crystal City Plate Glass Company with the late Hon. Ethan Allen Hitchcock as president. This plant has since been entirely rebuilt and is one of the largest plants of the Pittsburgh Plate Glass Company.

Some time later, Captain Ford became associated with Mr. John Pitcairn of Philadelphia and formed the New York City Plate Glass Company. The name was changed in 1883 to the Pittsburgh Plate Glass Company and a plant built at Creighton, Pennsylvania. This plant is still in existence and is known as Works No. 1 of the Pittsburgh Plate Glass Company.

Between the years 1885 and 1895, Captain Ford was instrumental in having plants erected at Tarentum and Ford City, Pennsylvania, the latter place being named in his honor. He died at Tarentum in 1903, at the age of 92.

Prior to 1880 not a square foot of plate glass had been made in the United States without financial loss to the manufacturer, but according to government reports the cost in 1884 was only one-half of the cost previous to 1879, due largely to the proficiency attained by the workmen. The same report gives the number of men engaged in the industry as 956, and the annual production at a little over one and one-half million square feet.

In all these early factories the European methods were used and European practices closely followed. The method in general was to fuse the raw materials in pots or crucibles placed in regenerative furnaces. When thoroughly melted and fined, the molten glass was poured on a cast iron table and rolled into a plate, after which the plates were placed in an annealing oven or kiln to remain for several days and the temperature was gradually decreased to a degree where the glass could be handled. The glass at this stage was about one-half inch thick and contained many surface irregularities and imperfections. These rough plates were drawn from the annealing kiln and examined; after cutting to eliminate the more

glaring defects, they were sent to the grinding department. In this department they were laid in plaster of Paris, upon square or octagonal shaped tables and revolved under iron shod runners, while sand ranging from quite coarse sizes to very fine was thrown on the glass until a flat surface was obtained. The plates were then turned over and the process repeated until both sides were finished or ground, the time required to grind each side being from eight to twelve hours. The plates were then removed, cleaned and again imbedded in plaster held by wooden frames, and rubbed one against the other by an eccentric motion, emery being worked in between the surfaces until a finely ground surface was obtained. When both sides had been smoothed in this manner, the plates were sent to the polishing department for final finishing. The polishers comprised square wooden tables upon which the glass was again laid in plaster and felt covered blocks were lowered upon the glass and the surface rubbed by a sliding motion until the desired finish was obtained. As is still the case, rouge was the polishing medium used. After this operation the glass was sent to the ware room where it was examined for defects and cut into size.

The modern plate glass plant still follows the above outlined procedure, only upon a much improved and more efficient basis. Very few changes have been made in the composition of plate glass or in the materials used in reducing the rough uneven surface to the familiar highly polished plate. However, various proportions of the ingredients used in the plate glass batch have been studied and better combinations have been adopted which produce glass of a superior quality. The various ingredients entering into the batch are subjected to chemical analysis and a much higher standard of purity demanded than was formerly the case.

Enumerating the major improvements which have been made, the first on the list is the grinding and smoothing operation. In 1889, at Crystal City, the English smoothers were abandoned and all the glass thereafter ground and smoothed on grinding machines. This necessitated changing the design of the old machines and round tables were substituted for the square or octagonal type. The effect of this new method was to reduce the grinding or smoothing time by over 50% and led directly to an improvement in the method of polishing. The table or deck on which the glass was laid formed a part of the old machine and it was therefore idle while the glass was being laid or turned over. As one hour was required to lay or turn over a table, and as this operation was necessary several times during the grinding, smoothing, and polishing, the time when the machine was idle was an item of considerable importance. In order to overcome this drawback, machines were designed, about the year 1900, with a removable table or deck made to fit any grinder. A number of extra tables were provided so that no machine would be idle.

Rough glass is now laid on the table, it is placed under the grinder, and when one surface is ground and smoothed, the table is transferred to a polishing machine to have the same surface polished. In the meantime one of the extra tables has been placed in the grinder and the machine is idle for only a few minutes. After the ground side has been polished, the glass is turned over and the reverse side ground and polished in a similar manner. This method requires handling the glass three times during the finishing operation instead of nine times which was necessary in the early factories. Present machines are idle for only the few minutes required to take out a table and replace it with another.

The old type English and Belgian polishing machines were also replaced by the circular type so that the tables or decks from the grinding machines could be placed in a similar machine equipped with polishing blocks. A study of the weights and arrangement of the polishing blocks, and the consistency and preparation of the rouge, together with the determination of the proper pressure per square inch and the most efficient speed to rotate the grinder and polisher tables has greatly shortened this operation.

Numerous minor improvements, such as the proper grading of the sand and emery, and the advent of electrically driven machinery has contributed to the success of this operation. Prior to 1889 when the first of these improvements was introduced, about ten days was required to produce a polished plate of glass from the raw materials. In the modern plate glass industry, it is now possible to deliver a mirror to your home, or put a plate glass top on your desk, in less than thirty-six hours after the sand, lime, and soda are placed in the crucible.

Another radical change or improvement was effected in the casting or melting department about the year 1900 when a continuous annealing leer was built at the Floreffe, Pennsylvania, factory of the Pittsburgh Plate Glass Company. The leer is a long low tunnel connected to a series of ovens (usually five). Immediately after the plate is rolled, it is placed in the first or hottest oven and at regular intervals is moved into the succeeding ovens until it reaches the runway or leer proper, where it is automatically carried on steel bars to the cutting table at the delivery end of the leer. The temperatures in the ovens and leer are so arranged that the glass is slowly cooled from 1200°F to 100°F. By this process only a few hours are required to properly anneal a plate, compared with four or five days in the old type kilns. This leer method of annealing glass was fully developed in America, and it was not until recent years that it was adopted by the European industries. This development increased the efficiency of the casting hall, in that the casting table is now stationary instead of being moved on tracks to the entrance of each annealing kiln, as was the former practice. In this department electricity has also played a prominent part and many devices have been developed for handling the

pots of molten glass and the large rough plates. Furnaces have also been improved and enlarged so that single rough plates containing 450 square feet of glass are now produced.

Within the last ten or twelve years the pot house department has received more attention, and various improved methods have been introduced in the preparation of pot batch. The individual clays entering into the batch have also been studied and while at one time it was thought necessary to use a certain amount of pot clay from Germany, it has now been proven that superior batches can be made using American clays exclusively. The process of building pots has not undergone any material change, although it has been proved practical to make pots by the casting process. In former years it was not uncommon to lose a large percentage of pots during the drying period, but by careful attention and careful control of temperature and humidity conditions, very few pots are now lost during the drying process. Further developments in the drying process have demonstrated that pots can be safely dried in much less time than was formerly required. The size of the unit of production has gradually increased and necessarily the pots have kept pace. In some factories large oval pots are now used, which produce a plate of glass containing 450 square feet.

Summing up briefly the outstanding features, the developments of plate glass industry have been:

1. Increase in all departments of the size of the unit handled.
2. Reduction in the annealing time from four days to a few hours.
3. Completing the grinding and polishing operation in a few hours instead of several days.
4. Extensive changes in the general plant equipment, so that a modern factory bears little resemblance to the plant built fifty years ago.

As late as 1900 with the equipment then in use it was not possible to make and handle a plate larger than 200 square feet, while now plates containing 450 square feet are produced. Instead of giving employment to 956 men and producing one and one-half million square feet as in the year 1884, the potential capacity of the American factories today is approximately one hundred million square feet, and employment is given to 20,000 men. French plate has ceased to be considered as the highest grade of polished plate glass as the American factories produce glass that is second to none in quality. A considerable amount has been exported and is able to compete on a quality basis with European glass.

And now the method of making plate glass is confronted with a new revolutionary process which promises to supercede practically every feature of the existing method, both as to process and equipment, but it is too early to give any details.

Research Department
Pittsburgh Plate Glass Co.
Creighton, Pa.

INVENTIONS AND PATENTS[1]

Some Phases of the Patent Law

By George E. Middleton[2]

Books have been written on the Patent Law. It is a broad subject and has many phases. In this short paper I cannot do more than touch upon it. Yet, having been a ceramic engineer myself, and, in my profession as a patent lawyer, coming in constant touch with engineers, I believe that I understand at least some of the problems with which you are faced in your relations with the patent system, and hope that I can offer a few profitable suggestions which may assist you in approaching these problems.

The mind instinctively associates the word "patent" with the word "invention." And this is quite right. For under our system no one may apply for a patent who has not invented something. But the word "invention" is too commonly associated with the word "genius"—evoking the image of the printing press, the cotton gin, the steam boat, the telegraph, and other classic and epochal inventions. But invention is only rarely like that. It is the multitude of little improvements, of improvements upon improvements, the rank and file of invention, that keep the wheels of progress turning. Then, too, we like to clothe invention with mysticism. In our fancy, we see it spring full-formed from the inventor's brain, like Minerva from the brow of Jove. Sometimes this is so, but not often. The worth-while inventions of today are the products of hard thought, developed after patient research to satisfy a recognized demand. The inventor today is the man in the shop, the engineer, the scientist—the man who knows his art, its deficiencies and its needs.

It has been these engineer-inventors who have made modern ceramics what it is and it is these men who will carry it still further. It is needless for me to speak of the progress of the past twenty-five years, except to emphasize the predominant part which your inventors have taken in it, and still more to emphasize the part which they must inevitably take in all future progress. And when I say "they," I really mean "you." Whether you realize it or not, you are inventors, actual or potential.

Of course, not all the improvements which an engineer makes are inventions. No one has yet formulated a definition of invention—and I cannot here discuss the several negative tests which are applicable—but it may safely be said that a large proportion of these improvements are inventions and are patentable; certainly a much larger proportion than the engineer commonly thinks. Believe me, then, when I say that, whether you know it or not, you are inventors. You are committed to invention.

[1] Pittsburgh Meeting, Feb. 12, 1923.

[2] Member of the New York Bar.

Now the Constitution empowers Congress "to promote the progress of science and the useful arts by securing for limited terms to inventors the exclusive rights to their discoveries," and Congress, acting under this power, has from time to time enacted legislation which forms the basis of our patent system and under which any inventor may, subject to certain restrictions, apply for and receive the exclusive right to his invention or discovery for a term of seventeen years. I suspect that many of you are not enthusiastic over our patent system. I well remember an editorial in the *Journal* not many years ago, which, to say the least, was not fulsome in its praise. Be it so, nevertheless this patent system is so interwoven into our industrial fabric that no industry is untouched by it, and no industry can afford to ignore it, least of all an industry which depends for its very existence on the brains of its engineer-inventors.

Hence, being exposed to the system, willy-nilly, and accepting it as the established order, what are you going to do about it? For you must do something.

A patent is, in effect, a contract. The nation says to the inventor: "If you will invent and disclose your invention to the people (observing certain prescribed formalities), teaching them how to use this new thing which you have conceived and developed, then you shall be granted the right to exclude all others from making, using, or selling it for a period of seventeen years."

The acceptance of this offer is not at all obligatory. You may accept it or reject it, but you cannot weigh the question forever. Within a certain time you must choose. It is imperative. You must bear in mind, too, that the offer is open to all. If you do not accept it, another may. What I shall try to do in this paper is to tell you briefly, not what your decisions should be, but rather what the consequences of those decisions will be. This is, indeed, of vital importance, not only to you as inventors, but to those for whom you are inventing.

Having made an invention, there are two matters to be considered, (1) how can you exclude others from the use of it, and (2) assuming that you do not care for a monopoly, how can you prevent others from obtaining a monopoly in it, excluding you and the public you wish to benefit?

Obtaining a Monopoly

There are just two ways of excluding others. You can

(*a*) Keep your invention a secret, or

(*b*) You can accept the nation's offer, make a full public disclosure, and patent it.

Secret Use

Let us first consider the advisability of keeping it a secret. Having made the invention, it is yours. You have a common law right to it and the

courts will protect you in the exercise of that right against one who obtains it from you by fraud. A patent in no sense gives you the right to use your invention, for, subject to the rights of others, that is your natural right. Thus you may enjoin to secrecy those who work with you or for you in the exploitation of your invention, provided always that the secrecy is genuine. But your position is a precarious one. In the old days, glaze formulae were handed down in secret from father to son and guarded jealously. That was possible then. Today it would be difficult. And once your secret has been discovered by another, by independent invention, by deliberate analysis of your product, or by well thought out scientific guessing, your secret is gone forever, and you have no redress. And once having definitely decided to operate in secret, you have renounced forever your right to apply for patent protection. Thus when discovery becomes imminent, you may not accept the offer of a limited monopoly which, in the first instance, you rejected. Another point: you must actually use your invention. If you discard it you will be held to have abandoned it, provided your actions are consistent with no other course, and a later independent inventor may not only reinvent it, but may get a patent and so prevent your later enjoyment of what was once your own.

In concluding this brief discussion of secret use, it may be pointed out that many inventions from their very nature cannot well be practiced in secrecy, hence if you desire to enjoy a monopoly in the practice of such inventions, the only course open to you is to patent them. Which brings us to consideration of that other method of obtaining a monoply.

Patenting

Our patent laws provide for the grant of patents to original and first inventors only, and between two or more original and independent inventors, the one first in time will prevail. And between an inventor and a public use or published description of the same invention, the former will prevail only if his invention is prior to the use or publication. Hence, the question of priority is of utmost importance to those seeking patent protection, and the question naturally arises—when is an invention said to be made?

The inventive act consists of two parts, one mental, the other physical; one the conception of means whereby the desired end can be attained, the other the actual embodiment of this conception,—reduction to practice, as the expression is. In the contemplation of the law, an invention is not complete until it has actually been reduced to practice, and if the inventor proceeds diligently to test out his conception, giving it a local habitation as well as a name, the date of his invention is the date of his conception. But inexcusable delay in reducing to practice may deprive the inventor of the right to carry the date of his invention back to the date of conception.

It is thus incumbent upon the inventor who hopes for a patent not to dream too long over his idea.

It is also incumbent upon him to keep records so that in the event of a contest, either with a rival inventor over the question of priority, or in a suit for infringement, he will have evidence at hand to prove his date and his diligence. It is not enough that your footsteps should echo and re-echo down the corridors of time. Clear and unmistakable footprints on the sands thereof are much more to the point. The existence of an inventive concept locked in the inner consciousness of the inventor is absolutely unprovable. As soon, therefore, as you conceive an invention, you should get it out of your system in some objective form, such as by making a written description of it or a sketch. Or you should explain it to someone who is capable of understanding it and who would testify to the disclosure if necessary. Indeed, it is well to do both of these things. Have someone write on the drawing or written description that he has read it and understands the invention. Then have him sign this statement and date it. Records should also be kept of the subsequent experimental work in reducing the invention to practice. In your research and works control laboratories, the daily laboratory records are usually adequate. In every case, however, it is well to have more than one investigator familiar, at least in a general way, with each investigation and development so that the testimony of the inventor can be corroborated.

There is a mistaken notion prevalent among inventors that if a patent is to be obtained, it must be applied for as soon as the idea has popped into the inventor's head. This is not so. On the contrary, it is much better to wait until experimental work has indicated not only the feasibility of the idea, but the probable lines of development. And as long as this reduction to practice is diligently pursued, no rights are lost, and it may be, and usually is, pursued in secret with no danger that the right to a patent will be held abandoned. As stated before, the effective date of your invention is the date of conception when followed by diligence in reducing to practice. It may happen, however, that actual embodiment of the invention may call for a large outlay of capital, or there may be other reasons why actual reduction to practice cannot be undertaken immediately. In such a case, the filing of an application is advisable, this application being considered a constructive reduction to practice, and in most cases satisfying the requirements for diligence.

It is not even imperative that an application be filed immediately after the invention has been completed. However, after the completed invention has been in public use, or on sale in this country for two years, or described in a printed publication for two years, be that publication here or in the uttermost parts of the earth, a conclusive presumption of abandonment to the public arises, and thereafter the right to apply for

a patent is absolutely lost. The law does not favor him who sleeps upon his rights and after the invention has been completed and proved, an application should be filed without undue delay, certainly within two years.

How to Prevent Others from Obtaining a Monopoly in Your Own Invention and Excluding You

But suppose now that you are a public benefactor and do not care to obtain a monopoly in your invention, although wishing at least to be able to use it yourself. If you have actually reduced it to practice and used it publicly, no subsequent inventor can get a valid patent covering it. But if you have never done this, if, let us say, the invention has never evolved beyond the experimental stage, although you may be convinced of its practical value, this abandoned experimental use will not act as a bar to a later inventor who may independently make the same invention, get a patent and stop you from practicing your own invention, at a later date. An invention which is never reduced to practice, or even if so reduced, never gets into public use, does not anticipate a later invention. It is important to bear this in mind.

How, then, can you prevent another from reinventing your abandoned or uncommercialized inventions, obtaining a patent which shall give him a monopoly and enable him to stop you from reviving and practicing what was once your own?

One solution, and perhaps the most simple one, is to publish the results of your experimental work in a printed publication. The mere reading of a paper at a convention is not enough. If your editor is agreeable (as to which I venture no opinion), I can think of no better medium of publicity than the *Journal* of this Society. The disclosure in this published article should be as complete as possible, setting forth all of the essential data, such as proportions, times, heat treatment, etc.—sufficient to enable one skilled in the art actually to practice the invention. A mere prophecy of probable results will not suffice. Such an article, if containing a clear and adequate disclosure, will make it impossible for a later inventor of the same thing to get a valid patent.

Another solution of the difficulty is to beat the other inventor to it and get a patent yourself. By doing this, you establish a date, at least as early as your filing date, and ordinarily you can carry back your date of invention much earlier. The later inventor must ante-date this to prevail.

Let us consider the effectiveness of these two solutions. If you publish your results, or actually put them in public use, it is true that no subsequent inventor can get a valid patent for the *same thing*. But this same thing, bear in mind, may be only the bare fundamental structure of your invention. Later improvements may, and probably will, be the features which give the invention real commercial value. Hence, a subsequent

inventor, stirred into activity by your publication, may make these valuable improvements upon your basic idea, and get patents which will actually dominate the field commercially and enable him to stop you, along with the general public which, in your altruism, you wish to benefit.

On the other hand, if you patent your invention, *you* are in a position to dominate the field, all later inventors having to pay tribute to you during the life of your patent, if you wish it. You may, of course, grant licenses free to those who wish to use your invention, and thus actually give the invention to the public quite as effectively as you might by a mere publication, more effectively, in fact, because you will be in a position to bargain with the later patentees for the protection of your public. It would still be true that these later patents could prevent your using the commercial improvements which they had made in your more fundamental invention, but as your patent would dominate, they, and their licensees, would be forced to do business with you if they would operate under their own patents.

It is, therefore, important to bear in mind that a dedication of an invention to the public can ordinarily be most effectively consummated through the actual obtaining of a patent. Public use and publication are useful but may simply stimulate activity and result in the issuance of improvement patents which may practically nullify the effect of your generosity.

To Sum Up

Do not stand in awe of the big word "invention." Have respect for your own improvements even though they may seem unimportant, and don't forget that patents are being granted on just such things.

If you wish to retain a monopoly in your inventions by practicing them in secret, very well, do so; but bear in mind that if another discovers your secret honestly your monopoly is gone.

If you decide to retain a monopoly through patents, proceed diligently to reduce your conceived inventions to practice and make applications for patent when this reduction is complete. Keep clear and authenticated records of all your work from conception to completion. File your applications within two years of first public use or sale of the inventions, and within two years of the date of the first description of them in a printed publication.

If you wish to make the public a gift of your inventions, publish a carefully prepared disclosure of them in some printed publication, or preferably, if you wish to protect yourself and the public from the patents of those who come later and improve upon your work, get patents yourself which will be broad enough to exact tribute from the improvement patentees, and thus enable you to trade with them for the protection of yourself and the public.

165 Broadway
New York City

ACTIVITIES OF THE SOCIETY

CHARTER MEMBERS HONORED AND NEWLY ELECTED OFFICERS INSTALLED AT BANQUET, FEBRUARY 12, 1923

The toast-master, Mr. L. E. Barringer, announced the results of the election as follows:

President, A. F. Greaves-Walker
Vice-President, R. D. Landrum
Treasurer, R. K. Hursh
Trustee, R. R. Danielson

Mr. Barringer then asked Professor Orton to take charge of the installation of these officers, and the following exercises took place:

Installation Exercises

Conducted by Professor Edward Orton, Jr., Founder of the World's First Department of Ceramic Engineering and of the American Ceramic Society

Mr. Toastmaster, before I attempt this difficult, and what may perhaps prove to be arduous, task, I should like to have some assurance as to how far my authority will go. Mr. Riddle, will you, as President of the Society until the next member thus honored is duly inducted into that high office,—Will you agree to back me up in any demand that I may make?

The Retiring President, Mr. Frank H. Riddle: Absolutely; go the limit! (Laughter.)

A good deal has been said about these charter members tonight, and most of them were placed on exhibit for a moment in the meeting this morning. But there are a few here who were not present at that time, and who perhaps do not know these men by sight; and I am going to take the liberty of asking them to rise in their places as I call their names, and remain standing for just a moment:

Mr. Charles Fergus Binns, Mr. Albert V. Bleininger, Mr. William D. Gates, Mr. Samuel Geijsbeek, Mr. Karl Langenbeck, Mr. Ellis Lovejoy, Mr. Herman C. Mueller, Mr. Francis W. Walker.

(Applause greeted each charter member as he rose upon his name being called.)

Face out, so they can all see you, boys! (Prolonged laughter and applause.)

Now a good deal has been said about the achievements of this little group,—all of a complimentary and flowery nature. My primary purpose in calling them to their feet in your presence here now, is not to laud them any more, but to serve as a sort of an object-lesson to you who are coming on. (Laughter.)

I do wish you to get this point of view. These men do not deserve any more adulation or praise or rewards of any sort for what they have done. They enjoy it; they lap it up, as Mr. Gates has indicated! (Laughter.) But the fact remains that they have been paid. They have been amply and well paid for the constructive work which they have done over this quarter of a century. They have drawn their pay as they went along. They had the fun of getting a big vision, and of seeing that vision come true. And I know that I speak for them truly when I say that you couldn't take the delight and the pleasure from them for the part that they have had in making this Society what it is, any more than the most cherished thing they possess. Am I right? (Applause.)

Well now, the application: These men are just common *homo sapiens*, the same as yourselves. They are not different. The chemists couldn't define their protoplasm as differing from yours. What they did, what they have enjoyed, is absolutely open

to the rest of us. Only one requirement: *Get the spirit that animated them!* And if this crowd,—five hundred of you, representing some nineteen hundred altogether, can animate yourselves with the same spirit and the same delight in doing things for the sake of doing them, that this group has had, the sky will hardly be the limit for the AMERICAN CERAMIC SOCIETY.

Now, there are two names on our list of charter members who can no longer be with us. Let us drink a silent toast to Ernest Mayer and to Jimmie Pass.

(Whereupon, the entire membership rose and drank, in silence, a toast to the departed members whose names had been mentioned.)

I should now like to have present themselves on the platform the following: Mr. Arthur F. Greaves-Walker, Mr. R. D. Landrum, Mr. R. C. Purdy, Mr. Ralph K. Hursh, Mr. R. R. Danielson.

(The gentlemen whose names were called, constituting the newly elected corps of officers of the SOCIETY, presented themselves on the platform.)

Now, ladies and gentlemen, this story that I am about to tell you is old to some of you; but this SOCIETY has grown very rapidly, and it may be new to some of you.

A certain member of this little charter group, Elmer E. Gorton, read a certain paper before the National Brick Manufacturers' Association twenty-five years ago, almost to a day. His paper was no very heavy composition; but it was the first attempt at that time to tell a non-technical audience an elementary fact about what constitutes a glaze, and how a glaze could be controlled. He told this story pretty well. He illustrated it on the black-board. He calculated his mixtures, and he got a respectful hearing from these brick men. It was evident that their attention was wandering from time to time, but they gave him a little perfunctory applause when he got through; and the chairman got up, and with a sort of sigh of relief said, "Well, we will take up next order of business!" Mr. Gorton came out of the hall, and I got up and followed him out, and Sam Geijsbeek, sitting here, followed me out also, and we walked down the hall with our arms around Gorton's shoulder. This happened, by the way, down at the old Monongahela House, at that time the best hotel in Pittsburgh.

As we walked out of that convention hall, Mr. Gorton said, "I don't feel very much pleased. I worked hard on this paper, but there does not seem to be any real interest here." We consoled him as we went along. About one hundred feet from the hall there was an old plush-covered settee—the same settee is there now, I think, that was there then! (Laughter.) I judge so, because the plush came off when I sat down on it twenty-five years ago, and it came off again today! (Laughter.) Three of us went down to our shrine today, and we sat on that old settee and speculated a little about things. On that former occasion Gorton was bemoaning the fact that he hadn't quite rung the bell with that paper. One of us said, "Well, there's only one way to cure that. If you want to have topics of this sort discussed by people that enjoy such matters, you will have to get the kind of people that enjoy them together. Why not try the thing out a little bit, and see if we couldn't organize just a small group that would care for such a paper?" Well, you know, once in a long time in men's careers, a suggestion like that will strike fire in the brains of others. I can't for the life of me say now whether it was Gorton or Geijsbeek or myself that made that suggestion. But anyhow all three of us were presently aflame with the new idea, and we talked it over for a few minutes, getting more and more interested, and we said, "Now, who is there here that could be relied on in this convention that would care for this thing?" And we speculated, and we picked on Gates, Lovejoy, W. D. Richardson, Bleininger, and two or three others,—eleven in number, and we gathered around the table that same night in a room now used as a drug-store and there we laid the plans for the AMERICAN CERAMIC SOCIETY.

As I say, we made our pilgrimage down to that shrine to-day. The shrine isn't much, but the inspiration which rose in us from the work we did there has been the keystone, I would say, in the lives of most of us.

I am telling you this little story, as I said in the beginning, that all of you newcomers into the SOCIETY, as well as the old members, may hear and know of the accidental—the almost accidental genesis of the organization.

Mr. Purdy, our efficient Secretary, has recently, in the monograph which he has gotten out in honor of this occasion, told the greater portion of this anecdote, but I wanted you to know it at first hand from those who actually participated in it.

Now, gentlemen, the characteristic of those first eleven men, and later the first twenty-two men, was the fact that they were idealists. The word "service," which is used so very frequently now in uplift organizations of all sorts, was not then in use. We didn't hear the word "service" in its common and frequent significance of today. We had no clubs or technical organizations which were stressing "service" at that time. But that little group of men saw a situation; they saw an old industry, a big industry, a fundamental industry. And they saw an industry standing low in the popular opinion; they saw an industry with very little progressiveness; they saw an industry with very little knowledge of its own problems. These men were acting individually. Most of them did not know each other well, some of them hardly at all. They did believe in the power of friendly coöperation. And as they associated themselves together, they soon believed in each other. Among them action begat action; faith begat faith. Action and faith move mountains. They believed, if the barriers of custom and suspicion should be broken down, and the real human being beneath could be approached, that the good in all these men in the clay industries would concur, and that there would be a greater future, as well as a happier present, for the clay industry, if this organization could unlock these old barriers. This little group of twenty-two men,—nine of us here to-night—did not and could not foresee what has happened; but they sensed very well that whatever happened would be in the direction of what has happened here.

(Professor Orton then turned to the newly elected officers.)

Now, you have been selected in the legal and constitutional manner, to take over the fortunes and guide the destinies of this great organization. In one sense your task is easier than that of your forebears, because your field is now defined and crystallized in the popular mind. In another sense, it's much more human, because the energies of these nineteen hundred men and women are so vast and so potential for good or for bad, that it's now a matter of national concern that this SOCIETY shall be well led. It did not matter much what the original twenty-two said or thought; they had no national status; but what this group says is a matter of national concern.

Now may I presume to say to you that there's just one key that will unlock the doors to all the difficulties that will arise in your behalf, and that key is the one which was forged by this little group,—the key of idealistic service, the unselfish desire to marshal your own forces and those for which you stand the chosen leaders for the betterment of your industry, for the betterment of this country, for the betterment of the human race. I believe that this cause is a holy cause. Our beloved SOCIETY has the same spirit exactly that animated the old Crusaders, as they sought for the Holy Grail. I will now read to you this induction pledge:

"The thing which marks one group of men as better than another is not their wealth, their culture, their skill. It is their spirit of coöperation, the ability and willingness to pool their energies unselfishly in the cause of human advancement. Recognizing the truth of this principle, do you now, in assuming the leadership of this splendid group of American scientists, accept your respective offices as a sacred trust, and

consecrate yourselves anew through service to this organization, to the broader service of mankind?"

The Officers-elect: I do.

Professor Orton: In virtue of the authority temporarily vested in me, I pronounce these men duly qualified and elected officers of this Association, and I extend the right hand of fellowship.

Mr. Greaves-Walker, President of the SOCIETY. (Applause.) Mr. R. D. Landrum, Vice-President of the SOCIETY. (Applause.) Mr. Purdy, the Secretary of the SOCIETY. (Applause.) Mr. Hursh, your Treasurer. (Applause.) Mr. Danielson, your newly elected member of the Board of Trustees. (Applause.)

Secretary Purdy: I should like to ask Mr. Salisbury and Mr. Howe to stand up with those here, that all may see those who are guiding the destinies of this association.

The Toastmaster, Mr. Barringer: Professor Orton, you have just stated, in sketching the origin of the SOCIETY, that one of your former pupils, Mr. Gorton, presented for the first time before the National Brick Makers' Association a technical paper, describing a series of experiments, using chemical formulae as the basis. Your students know that Gorton could not have presented that paper if it had not been for yourself. In your address this morning, you stated that character-building was the foundation of education. From the first class that entered your instruction in 1894, throughout the period of your teaching, I am sure that every one of your pupils has realized that you have been preëminently a teacher who has builded character.

I have here a book containing the letters of some fifty of your former pupils attempting to state their appreciation of what you have done for them, not by advice and instruction in the class-room only, but by the inspiring example of your character, of your being yourself, all that is worth while in life. There is one chap here who says that he saw the best side of Professor Orton, because he was a fellow in need. That student is not alone. I know a half dozen of them. I myself, as one of Professor Orton's pupils, was a "fellow in need," and I know that there's where his friendship and sympathy and encouragement shine to the best effect.

We have also gathered here the papers with reference to the placing of a portrait of Professor Orton in the Ceramic Building at Rutgers College.

What a different world this would be, gentlemen and ladies, if each one of us could influence the lives, and definitely know it, of at least fifty people. Professor Orton, I know you have touched the lives of hundreds. But here, as an appreciation of this group of fifty, we wish to present you with a collection of letters expressing, as best they can, their love for you and their heartfelt gratitude for what you have been to them. (Prolonged applause.)

Professor Orton: Mr. Chairman, you certainly couldn't expect any response to this. Something of this sort deprives one of the ordinary modes of communication. All I can say is that this book will remain my very dearest possession. (Applause.)

THE SILVER JUBILEE CONVENTION EXHIBIT OF CERAMIC PRODUCTS

The exhibit this year was larger, better, and covered a wider range than did the exhibit of 1922. The interest shown in this exhibit by the attending delegates and by local ceramists has established it as a feature of the annual conventions. A special committee will hereafter take the responsibility of organizing and caring for the exhibit.

Although the Art Division has, for the past two years, been through the difficulties of getting organized and of building up a program of service, it conceived and success-

fully carried into execution the exhibit of ceramic products. Rather than being a load, or to any degree adding to the responsibilities which the officers of this Division were assuming, they found that the exhibit assisted in attracting new membership support to their Division work and program. To Mr. Frederick H. Rhead belongs the credit of having established this instructive feature of our annual convention. He has given to it a large amount of time and, of greater value, the required executive and artistic ability so essential to the success of so ambitious an enterprise. To Mr. James C. Boudreau and Mr. H. S. Kirk, able collaborators with Mr. Rhead, is due a large share of the credit and praise for the success of the 1923 exhibit.

The following individuals and firms were the exhibitors:—

Art Division

Arthur E. Baggs, Marblehead, Mass.
Newcomb Pottery, New Orleans, La.
Paul Revere Pottery, Boston, Mass.
Overbeck Pottery, Cambridge City, Ind.
Fulper Pottery, Flemington, N. J.
Russel Crooks, Boston, Mass.
Wahl Co., Chicago, Ill.
Munsell Color Company, New York City.
Frederick H. Rhead, Zanesville, Ohio
Mrs. Frederick H. Rhead, Zanesville, Ohio
Mrs. Bertha Riblet Pire, Wesleyville, Pa.
Miss May Elizabeth Cook, Columbus, Ohio
Rookwood Pottery Co., Cincinnati, Ohio

Educational Exhibits

The Carnegie Library, Pittsburgh, Pa.
Schenley High School, Pittsburgh, Pa.

Enamel Division

Stanley Insulating Co., Great Barrington, Mass.
O'Hara Waltham Dial Company, Waltham, Mass.
The Elyria Enameled Products Co., Elyria, Ohio
The Vitro Manufacturing Co., Pittsburgh, Pa.
Vitreous Steel Products Co., Nappanee, Ind.

Glass Division

Corning Glass Works, Corning, N. Y.
Bausch & Lomb Optical Co., Rochester, N. Y.

Heavy Clay Products Division

Hydraulic Press Brick Co., Roseville, Ohio

Refractories Division

Lavino Refractories Co., Philadelphia, Pa.
American Refractories Co., Joliet, Ill.
Mitchell Clay Manufacturing Co., St. Louis, Mo.
The Carborundum Co., Keasbey, N. J.
Charles Engelhard, Inc., New York City
Crescent Refractories Co., Curwensville, Pa.
Precision Grinding Wheel Company, Philadelphia, Pa.
Norton Company, Worcester, Mass.

Terra Cotta Division

Conkling-Armstrong Terra Cotta Co., Philadelphia, Pa.
Midland Terra Cotta Co., Chicago, Ill.
New York Architectural Terra Cotta Co., Long Island City, N. Y.

White Wares Division

Edwin M. Knowles China Co., Newell, W. Va.
The Mayer China Co., Beaver Falls, Pa.
Universal Sanitary Manufacturing Co., New Castle, Pa.
Hardinge & Co., Inc., New York City
Coors Porcelain Co., Golden, Colo.
The Homer Laughlin China Co., Newell, W. Va.
National Lime Association, Washington, D. C.
O'Brien & Fowler, Buckingham, Quebec, Can.
Saskatchewan Government and University, Saskatoon, Canada
Beaver Falls Art Tile Co., Beaver Falls, Pa.
The Roessler & Hasslacher Chemical Co., New York City.

THE WHITE WARES DIVISION

At the annual meeting of the White Wares Division, held in Pittsburgh, February 13 and 14, the following officers were chosen for the coming year:

Chairman.....F. H. Riddle
Secretary.....C. C. Treischel

Chairmen of Committees and Representatives on Coördinating Service Council

Research.....F. K. Pence
Standards.....H. Spurrier on Specifications
George Sladek on Tests
Membership.....Ira E. Sproat
Rules.....August Staudt
Ceramic Education.....Geo. H. Brown
Data.....C. C. Treischel
Nominating.....C. E. Jackson

In the work for the coming year the Division will concentrate on (1) A Classification for Feldspars, (2) Specifications and Classification for Flint and Whiting, (3) Coöperative Research on Saggers, (4) Researches on Domestic Ball Clays, (5) Researches on Kiln Firing, (6) The Ceramic Handbook.

Items (1) and (2) will be taken up by the Standards Committee which is to consist of ten members, six representing the consumers and four the producers. This Committee expects to hold three meetings during the year and hopes to develop a Classification that can be used as a basis for drawing up Specifications.

Item (3) will be handled by the Research Committee and their efforts will be directed toward a united effort on the part of the Bureau of Standards and the various Trade Associations of this Division.

Items (4) and (5) will be the basis for papers for the next annual meeting.

C. C. Treischel, *Secretary*

PROPOSED AMENDMENTS TO THE CONSTITUTION

Article II, Section 5, to read

"Active Members must be persons competent to fill responsible positions in Ceramics. Only Associate Members shall be eligible to election as Active Members and such election shall occur automatically twenty-four months after acceptance as an Associate Member."

Article IV, Section 1, to read

"The affairs of the Society shall be managed by a Board of Trustees, consisting of the President, Vice-President, Treasurer, the two most recent past Presidents, and one trustee representative of each of the Divisions. The President, Vice-President and Treasurer shall be elected to serve one year. Each Trustee shall be elected to serve three years."

Article V, to read

NOMINATIONS AND ELECTIONS

(1) Nominating Committee. The Nominating Committee shall be composed of the two most recent past Presidents and one representative selected by each Division and by each Local Section. The Secretary of the SOCIETY shall be Chairman (without vote).

(2) Any ten Active Members may constitute a self-appointed Nominating Committee and present names of nominees for President, Vice-President, and Treasurer to the Secretary for placement on the election ballot, provided such names are presented at least thirty days before the annual meeting.

(3) Nominations for President, Vice-President, and Treasurer. The Nominating Committee shall, by majority letter vote, select nominees for President, Vice-President, and Treasurer.

(4) Nominations for Trustees. Each Division by plurality letter vote of the major members of the Division shall select a nominee for Trustee to serve for a period of three years, according to the schedule provided in Section X of the By-Laws.

The names of the nominees for Trustees thus chosen by the Divisions shall be transmitted to the Secretary of the SOCIETY (as ex officio Chairman of the Nominating Committee) not later than September first, and by him shall at once be transmitted to the members of the Nominating Committee, and shall be placed on the election ballot.

At least ninety days before the annual meeting the Secretary shall send the names of all nominees to each voting member of the SOCIETY.

(5) Election. The names of all nominees, provided their assent has been obtained before nomination, shall be placed upon a printed ballot in alphabetical order and shall be mailed to each voting member not in arrears at least twenty days before the annual meeting. The voting shall be confined to the names appearing on this ballot. The ballot shall be enclosed in an envelope on which there shall be no mark of identification other than the word "Ballot." The envelope shall be enclosed in another envelope for mailing, addressed to the Secretary, upon the back of which the voter shall endorse his name.

The envelopes and ballots shall be opened in the presence of three scrutineers appointed by the President, who will report the result of the election at the annual meeting.

A plurality of affirmative votes cast shall elect.

Article VII. Add following clause to the last sentence of Paragraph I.

"—but for purpose of nominating for Division representative on the Board of Trustees each member must declare one and only one Division as his major Division, and he shall be designated as a major member of that Division."

Article XII. For the words "a regular meeting" substitute the words "the annual meeting" as provided in Section I of the By-Laws.

By-Laws. Section X.

To provide for rotation of the nominations of Trustees as representatives of the Divisions, as provided in Articles IV and V of the Constitution, some shall be nominated in 1923 to serve portions of the three-year terms as follows:

Terra Cotta to serve three years.
Enamels to serve one year.
Refractories to serve one year.

White Wares to serve two years.
Art to serve one year.
Heavy Clay Products to serve three years.
Glass to serve two years.

By-Laws. Section XI. Same as present Section X

BETWEEN SEASONS

The ski-jumping season was short and the record of membership work for March is shorter. Winter sports are over, spring sports are not yet in vogue, except the sports in the south and they aren't hunting for members. The list is fully as long as many a list of last year, but after the towering total reported last month it is a bit of a come-down. Our college professors rallied at the time of need, as they do so often, and A. S. Watts sent in two names, R. K. Hursh, two, C. W. Parmelee, two, J. B. Shaw, one, and D. A. Moulton, one. Karl Türk and L. R. Allison also sent in two each. The rest of the scoring was scattered, geographically and numerically. Illinois leads with seven, closely rivaled by Ohio with six. Maryland, New Jersey, and Pennsylvania each sent two representatives. Massachusetts, New Hampshire, Maine, Iowa, Indiana, New York, and Washington say "present" once each, as does Canada, while remarkably enough two members from Holland clattered over just in time to get listed.

The roll of workers follows:

	Personal		Personal
Gordon B. Wilkes	1	Charles A. Smith	1
D. A. Moulton	1	R. K. Hursh	2
A. S. Watts	2	Chas. E. Kraus	1
Joseph Keele	1	L. E. Barringer	1
B. T. Sweely	1	J. B. Shaw	1
L. R. Allison	2	C. W. Parmelee	2
W. A. Hull	1	G. Z. Minton	1
Karl Türk	2	H. S. Kirk	1
R. W. Hemphill	1	Office	7

Total 29

STATUS OF MEMBERSHIP

	Personal	Corporation
Status Jan. 12	1611	216
Dropped for non-payment of dues	21	1
	1590	215
Resigned	19	2
	1571	213
New Members received since Jan. 12	139	10
Status March 14	1710	223

The net increase therefore has been 99 personal and 7 corporation members. Resignations will be fewer for the remainder of the year and there will be no more dropped for non-payment of dues, since this act of swift justice occurs but once a year. There remain, therefore, 301 personal and 93 corporation memberships to be obtained in order to fulfil the hopes and plans of the budget. There are forty-one weeks left in 1923. There has been an average of five memberships a week received in the office of the Secretary, without any special effort by anyone so far as is known. Is there any reason why we cannot reach the necessary average of 7.31 personal members and 2.26 corporations every week. This means of course that many more must be received some weeks in order to cover the lean summer months when nobody joins anything except the lip and the cup of ice-water. Let's begin right away!

NEW MEMBERS RECEIVED FROM FEB. 11 TO MARCH 14, 1923

Bates, Oscar Kenneth, Room 4–145, Mass. Institute of Technology, Cambridge, Mass., Instructor of Physics.

Bruechert, Horace, 2826 West St., Ames, Iowa, Student, Iowa State College.

Campbell, John, Asbestos Wood Co., Nashua, N. H., Chemical Engineer.

Clawson, C. D., 1942 Iuka Ave., Columbus, Ohio, Student, Ohio State University.

Fréchette, Howells, Mines Branch, Dept. of Mines, Ottawa, Canada, Chief of Division of Ceramics and Road Materials.

Fusselbaugh, Reardon, 2028 Mt. Royal Ave., Baltimore, Md., Assistant Superintendent, Baltimore Enamel & Novelty Co.

Gallagher, Hugh S., Box 165, East Liverpool, Ohio, Vice-President, National Products Co.

Galvin, Gerald M., 2223 S. 18th St., Philadelphia, Pa., U. S. Navy Yard.

Gould, James, 1510 Electric St., Scranton, Pa., Superintendent, Scranton Enameling Co.

Hersey, Geo. F., Colonial Insulator Co., Akron, Ohio, Superintendent, Colonial Insulator Co.

Hobson, Stanley H., Geo. D. Roper Corp., Rockford, Ill., Director of Engineering.

Koenig, Franz J. M., Ivan Beirenstraat 12, Schoonhoven, Holland, Industrial Manager, Schoonhoven Pottery.

Legnard, W. M., 20 E. Jackson Blvd., Chicago, Ill., Vice-President, Interstate Clay Products Co.

Lucktenberg, Wm. H., Zanesville, Ohio, Vice-President, The Burton-Townsend Company.

Milliken, Edward C., 1892 N. High St., Columbus, Ohio, Student, Ohio State University.

Mundy, O. S., 905 W. Green St., Urbana, Ill., Student, University of Illinois.

Neiswanger, Samuel O., 107 S. 3rd St., Champaign, Ill., Student, University of Illinois.

Patch, Clifford, Bangor, Maine, Chemical Engineer, Orono Pulp & Paper Co.

Schoonenberg, Pancras, Library Dept., Philips' Glowlampworks, Eindhoven, Holland, Managing Engineer.

Scott, A. Lincoln, Auditorium Tower, Chicago, Ill., Research Engineer, American Hotels Association.

Tsou, We Wei, 76 W. Frambes Ave., Columbus, Ohio, Student, Ohio State University.

Vachuska, Edward J., Alfred, N. Y., Student, New York State School of Ceramics.

Watts, Orlando S., 629 Walnut St., Camden, N. J., President, Standard Enameling & Mfg. Co.

Weiskittel, Harry C., Jr., 4500 E. Lombard St., Baltimore, Md., Assistant Manager, A. Weiskittel & Son Co.

Whitehead, Fred, Foskett St., Trenton, N. J., Proprietor, Whitehead Pottery Co.
Williams, Glenn D., 836 N. County St., Waukegan, Ill., Ceramic Engineer, Chicago Hardware Foundry Co.
Wilson, J. A., 1001 South B St., Elwood Ind., Pittsburgh Plate Glass Co.
Worman, Eugenie A., 4809 Beach Drive, Seattle, Wash., Teacher of Pottery, University of Washington.
Wright, Edward P., Irwin, Ill., Student, University of Illinois.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Richard M. Balmert, formerly superintendent of the Lyth Tile Co. at Angola, N. Y., is now living at 1605 W. Lombard St., Baltimore, Md.

R. R. Danielson has recently affiliated himself with the Beaver Enameling Co. at Ellwood City, Pa. He is still connected with the Bureau of Standards and is in Washington part of the time.

M. C. Booze has been made Senior Fellow in Refractories at the Mellon Institute, Pittsburgh, taking the place of **R. M. Howe** who is now with the Kier Fire Brick Co.

E. A. Brockman and **A. C. Stepan,** of the Roessler and Hasslacher Chemical Co., may be found at the new offices of the company, 230 E. Ohio St., Chicago.

Sven Fogelberg, who was Assistant Director of the Kosta Glass Works, is now at the Hammars Glaswerk, Askersund, Sweden.

G. F. Bissell, of the Chicago Retort and Fire Brick Co., at Ottawa Ill., is now at the Chicago office of the firm.

Benjamin Alderson, who is connected with the American Bottle Co., has been transferred from Streator, Ill., to Newark, Ohio.

Victor W. Boeker, a student in the Ceramic Department of the University of Illinois, is now living at 1210 W. Illinois St., Urbana.

Charles J. Corty, superintendent of the American Foundry and Range Co., has moved from Arthur St. to 507 East A St., Belleville, Ill.

H. D. Callahan, with the National Fire Proofing Co., gives as his new address, 87 Maple Place, Keyport, N. J.

George Brain, for many years manager of the Universal Sanitary Mfg. Co., has recently taken a position with the Standard Sanitary Mfg. Co. at Tiffin, Ohio.

G. L. Rogers, of the Denny Renton Clay and Coal Co., has been transferred from Renton, Washington, to the Seattle office of the firm.

C. A. Underwood has been placed in the New York office of the American Refractories Co. at 120 Broadway, instead of at the Joliet, Illinois, plant.

G. W. Greenwood has changed his address from Wilkes-Barre to Dunbar, Pa.

NOTES AND NEWS

WHAT THE AMERICAN SOCIETY FOR TESTING MATERIALS HAS DONE IN CERAMICS

Papers Dealing with Clay Products

"A Machine for Testing Clay Products," by Mont Schuyler, Vol. XIV, Part II, p. 557 (1914).

"The Legal Interpretation of the Word 'Vitrified' as Applied to Ceramic Products," by Edward Orton, Jr., Vol. XV, Part II, p. 245 (1915).

"Comparison of Heat-Insulating Properties of Materials Used in Fire-Resistive Construction," by W. A. Hull, Vol. XVII, Part II, p. 422 (1917).
"Failure of a 30-in. Tile Drain at Albert Lea, Minnesota," by R. W. Crum, Vol. XVII, Part II, page 453 (1917).
"The Necessity for Inspection and Testing of Refractory Brick," by C. E. Nesbitt and M. L. Bell, Vol. XVIII, Part II, p. 336 (1918).
"Preventable Defects in Refractory Bricks," by C. E. Nesbitt and M. L. Bell, Vol. XIX, Part II, p. 619 (1919).
"Testing of Porosity of Electrical Porcelain," by W. D. A. Peaslee, Vol. XX, Part II, p. 495 (1920).
"Vital Factors in the Testing of Fire-Clay Refractories and in the Interpretation of Results," by R. M. Howe, Vol. XX, Part I, p. 278 (1920).
"A Study of the Proposed A.S.T.M. Tentative Specifications for Building Brick and a Correlation of Their Requirements with Sodium-Sulfate Treatment and Actual Freezing," by Edward Orton, Jr., Vol. XIX, Part I, p. 268 (1919).
"Practical Methods for Testing Refractory Fire Brick," by C. E. Nesbitt and M. L. Bell, Vol. XVI, Part II, p. 349 (1916).
"Testing of Refractories," by A. V. Bleininger, Vol. XIII, p. 967 (1913).
"Slag Test for Refractory Brick Used in the Iron and Steel Industry," by C. E. Nesbitt and M. L. Bell, Vol. XVII, Part I, p. 314 (1917).
"A Study of the Rattler Test for Paving Brick," by M. W. Blair and Edward Orton, Jr., Vol. XI, p. 776 (1911).
"Notes on Brick Pier Tests," by James E. Howard, Vol. VII, p. 475 (1907).
"Some Further Experiments upon the Absorption, Porosity and Specific Gravity of Building Brick," by D. E. Douty and L. L. Beebe, Vol. XI, p. 767 (1911).
"The Influence of the Absorptive Capacity of Brick upon the Adhesion of Mortar," by D. E. Douty and H. C. Gibson, Vol. VIII, p. 518 (1908).
"The Rattler Test for Paving Brick as a Safe Method of Disclosing the Limit of Permissible Absorption," by Edward Orton, Jr., Vol. V, p. 287 (1905).
"Standard Tests for Drain Tile and Sewer Pipe," by Anson Marston, Vol. XI, p. 833 (1911)

List of A.S.T.M. Standards and Tentative Standards Dealing with Ceramics

A.S.T.M. Standard Specifications for:

Paving Brick (C7–15)
Building Brick (C21–20)
Clay Sewer Pipe (C13–20)
Drain Tile (C4–21)

A.S.T.M. Standard Methods of:

Test for Refractory Materials under Load at High Temperatures (C16–20)
Test for Porosity and Permanent Volume Changes in Refractory Materials (C20–20)
Test for Softening Point of Fire-Clay Brick (C24–20)
Ultimate Chemical Analysis of Refractory Materials, including Chrome Ores and Chrome Brick (C18–21)

A.S.T.M. Standard Recommended Practice for:

Laying Sewer Pipe (C12–19)

A.S.T.M. Standard Definitions of:

Terms Relating to Sewer Pipe (C8–15)
Terms Relating to Clay Refractories (C27–20)

A.S.T.M. Tentative Specifications for:

Clay Sewer Brick (C23–21 T)
Required Safe Crushing Strengths of Sewer Pipe to Carry Loads from Ditch Filling (C15–17 R)
Clay Hollow Building Tile (C34–21 T)

A.S.T.M. Tentative Methods of:

Test for Slagging Action of Refractory Materials (C17–19 T)
Test for Resistance of Fire-Clay Brick to Spalling Action (C38–21 T)

A.S.T.M. Tentative Definitions of:

Terms Relating to Hollow Tile (C43–21 T)

GLASSWARE AND POTTERY EXHIBITS TO BE FEATURED IN NATIONAL EXPOSITION AT ATLANTIC CITY THIS SUMMER

The American Home and City Beautiful Association has recently issued an announcement outlining plans for a great Industrial American Exposition, to rival the greatest of those of the European countries, which will take place on the Million Dollar Pier, Atlantic City, N. J., from June 16 to September 8, 1923. The Exposition is arranged with a two-fold object of encouraging the use of articles of American manufacture and the education of the people of the United States in home and city beautification.

All of the exhibit floor space of the Million Dollar Pier—America's most attractive exhibition structure (in excess of 100,000 sq. ft.)—has been engaged for this exhibit, which will be devoted to eight principal groups with more than thirty allied classifications as follows:—Public and Private Buildings, materials, equipment, and furnishings; The Garden, seeds, accessories, and supplies; Art, Sculpture and Ornaments; Musical Instruments and Reproducers; The City Beautiful embracing Municipal Improvements, Hygiene, Sanitation, Accident and Fire Prevention; Pure Food Products, Confections and Beverages; Recreation, Athletics; Resort and Travel information, to boost "Seeing America First;" and an important section devoted to Radio.

Realizing the importance of the Glass and Pottery industry, as producers of essentials of practical utility and beauty in the home, the Exposition Management has set aside some of the most attractive sections of the Exposition to display and demonstrate the various kinds of Pottery, Glassware, China and Art novelties, and a varied assortment of household utilities.

Various trade organizations interested in the several branches of these industries as well as individual manufacturers and distributors will be prominently represented at the Exposition.

An Exposition folder giving full particulars regarding the exhibition will be mailed free to those who apply to the American Home and City Beautiful Exposition, Million Dollar Pier, Atlantic City, N. J.

LIST OF PUBLICATIONS OF CERAMIC INVESTIGATIONS, U. S. BUREAU OF MINES

PUBLISHED IN OUTSIDE JOURNALS

"The Effect of Some Electrolytes on the Properties of Clays" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 3, 1918.

"A Pycnometer Operated as a Volumeter" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 8, 1918.

"The Properties of Some Ohio and Pennsylvania Stoneware Clays" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 4, 1918.

"Fusibility of Graphite Ash and its Influence on the Refractoriness of Bond Clay" (M. C. Booze). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 1, Jan., 1919.

"Behavior under Brass Foundry Practice of Crucibles Containing Ceylon, Canadian, and Alabama Graphites" (R. T. Stull). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 3, March, 1919.

"Experiments in Dead-Burning Dolomite" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 4, April, 1919.

"Effect of Variable Pressure and Tar Content on the Briquetting of Alabama Graphite" (Stull and Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 5, 1919.

"Some Properties of Bond Clays for Graphite Crucibles" (M. C. Booze). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 6, 1919.

"The Effect of Electrolytes on the Properties of Graphite Crucible Bodies" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 6, 1919.

"A Machine for Testing the Hot Crushing Strength of Firebricks" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 2, No. 8, Aug., 1919.

"The Position of Clay Products in the Field of Earthen Products" (R. T. Stull). *Brick and Clay Record*, March 6, 1919.

"Graphites and Bond Clays for Crucible Making Purposes" (R. T. Stull). *Proc. 22nd Am. Mining Congress*, p. 766, Nov. 17–21, 1919.

"The Need of Technical Assistance in the Brick Industry" (R. T. Stull). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 3, March, 1920.

"Government Service in Developing the Clay Industry" (R. T. Stull). *Clay Worker*, March 25, 1920.

"Elutriation Tests on American Kaolins" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 5, May, 1920.

"Behavior of Fire Brick in Malleable-Furnace Bungs" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 7, July, 1920.

"The Fusibility of Mixtures of Graphite Ash and Bond Clays" (R. N. Long). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 8, Aug., 1920.

"A Direct Reading Overflow Volumeter" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 9, Sept., 1920.

"Some Properties of Refractories" (R. T. Stull). *Proc. Electric Furnace Assoc.*, meeting at Columbus, O., Oct. 6, 1920.

"The Effect of Wet Grinding, Screening, and Electrolytes and Dextrine on Clays of Low Plasticity" (H. W. Douda). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 11, Nov., 1920.

"Experiments in Aventurine Glazes" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 3, No. 12, Dec., 1920.

"Experiments in Dead-Burning Dolomite and Magnesite" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 2, Feb., 1921.

"Some Properties of Bodies and Glazes Used in the Pottery Industry, together with notes on Lusters and Aventurine Glazes" (H. G. Schurecht). *New Jersey Ceramist*, Vol. 1, No. 1, March, 1921.

"Notes on the Effects of Firing Temperatures on the Strength of Fireclay and Stoneware Bodies" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 5, May, 1921.

"The Separation of Lime from Dolomite" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 7, July, 1921.

"Sedimentation as a Means of Classifying Extremely Fine Clay Particles" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 4, No. 10, Oct., 1921.

"The Degree to which Different Glaze Compositions Take Vapor Lusters" (R. T. Watkins). *Jour. Am. Ceram. Soc.*, Vol. 5, No. 1, Jan., 1922.

"The Microscopic Examination of the Mineral Constituents of Some American Kaolins" (H. G. Schurecht). *Bull. Am. Ceram. Soc.*, Vol. 5, No. 1, Jan., 1922.

"Mechanism of Plasticity from Colloid Standpoint" (G. A. Bole). *Jour. Am. Ceram. Soc.*, Vol. 5, No. 8, August, 1922.

"An Account of an Investigation of Some Georgia Clays and Bauxites" (Gilmore and Fessler). *Jour. Am. Ceram. Soc.*, Vol. 1, No. 5, Sept., 1922.

"A Simple Control Porosimeter" (G. A. Bole—F. G. Jackson). *Brick and Clay Record*, Vol. 61, No. 5, Sept. 5, 1922.

"The Mechanical Movement of Water through Clays and its Control" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 5, No. 12, Dec., 1922.

"Purification and Analysis of ZrO_2" (Jackson-Shaw). *Jour. Am. Chemical Soc.*, Dec., 1922.

"Note on Direct Reading Automatic Laboratory Scale for Weighing Briquettes" (H. G. Schurecht). *Jour. Am. Ceram. Soc.*, Vol. 6, No. 3, March, 1923.

"Tests on Some Refractory Clays of California" (H. W. Douda). *Jour. Am. Ceram. Soc.*

"Dolomite Cements Involving the Sorel Reaction" (Stull and Schurecht). *Jour. Am. Ceram. Soc.*

"The Properties of Some Clay-Like Minerals of the Bentonite Type" (Schurecht and Douda). *Jour. Am. Ceram. Soc.*

"Coal Formation Clays of Ohio" (Stout, Stull, Demorest, McCaughey). *Ohio Geol. Survey Bulletin.*

"Permeability of Refractories to Air" (H. W. Douda). *Jour. Am. Ceram. Soc.*

"Preliminary Report on the Residual Kaolin and Feldspar in the Pacific Northwest" (H. Wilson, A. L. Bennett, and F. T. Heath). *Jour. Am. Ceram. Soc.*, Vol. 6, No. 3, March, 1923.

"Clays and Shales in the State of Washington, their Technology and Uses" (Hewitt Wilson). *State Bulletin*, Wash., 1922.

The above publications are usually available in large technical libraries, or can possibly be purchased by writing the publishers or book-dealers who specialize in the sale of back numbers of trade and technical journals.

Issued as a Publication of the Bureau of Mines

Bulletins

*Bulletin 53. "Mining and Treatment of Feldspar and Kaolin in the Southern Appalachian Region," by A. S. Watts. 1913. Out of print.

**Bulletin 71. "Fuller's Earth," by C. L. Parsons. 1913. 5 cents.

**Bulletin 92. "Feldspars of the New England and Northern Appalachian States," by A. S. Watts. 1916. 25 cents.

Bulletin 112. "Mining and Preparing Domestic Graphite for Crucible Use," by G. D. Dub and F. G. Moses. 1920.

Bulletin 128. "Refining and Utilization of Georgia Kaolins," by I. E. Sproat. 1916.

**Bulletin 160. "Rock Quarrying for Cement Manufacture," by Oliver Bowles. 1918. 25 cents.

TECHNICAL PAPERS

*Technical Paper 99. "Probable Effect of the War in Europe on the Ceramic Industries of the United States," by A. S. Watts. 1915. Out of print.

Technical Paper 126. "The Casting of Clay Wares," by T. G. McDougal. 1916.

**Technical Paper 155. "Gypsum Products, Their Manufacture and Uses," by R. W. Stone. 1917. 20 cents.

Technical Paper 203. "Labor Saving at Limestone Quarries," by Oliver Bowles. 1919.

Technical Paper 212. "The Determination of Combustible Matter in Silicate and Carbonate Rocks," by A. C. Fieldner, W. A. Selvig, and G. B. Taylor. 1919.

**Technical Paper 233. "The Properties of Some Stoneware Clays," by H. G. Schurecht. 1920. 10 cents.

Technical Paper 281. "The Use of Electrolytes in Purifying Clays," by H. G. Schurecht. 1922.

* Can be consulted at most public libraries.

** Obtainable only through the Superintendent of Documents, Government Printing Office, Washington, D. C., at the price indicated.

ELECTRIC FURNACE REFRACTORIES

In a general study of electric furnace refractories, being made by the Ceramic Experiment Station of the United States Bureau of Mines, Columbus, Ohio, conductivity tests are to be made of alundum, carborundum, sillimanite, spinel, silica, and magnesite.

COÖPERATIVE WORK ON REFRACTORIES

The Bureau of Mines laboratory car Holmes is now at the plant of the American Refractories Company in Baltimore where initiatory work on the coöperative investigation between the Refractories Manufacturers' Association and the Bureau has begun. The objects of this investigation are to decrease fuel consumption in burning refractories, to shorten the time of burning, and to improve the quality of the product.

This coöperation is conducted through a committee of the Refractories Manufacturers' Association, of which S. M. Kier of Pittsburgh is chairman. The car serves as laboratory and living quarters for the crew conducting the investigation, which consists of seven technical men, a cook and a mechanic's helper. The technical force consists of four ceramic engineers and three fuel engineers, all of whom have had experience on problems of this type. The ceramic men are E. P. Ogden, foreman in immediate charge of the work, Alfred Whitford, A. E. Rupp and A. H. Fessler. The fuel engineers are W. E. Rice, car manager, R. F. Lunger and F. Wentzel.

After about a month's stay at the Baltimore plant the car will go to six other plants situated at Brooklyn, N. Y.; Womelsdorf and Salina, Pa.; Hayward Station and Taylor, Ky.; and Ottawa, Ill.

This work is under the immediate supervision of G. A. Bole, superintendent of the Bureau of Mines Ceramic Station, Columbus, Ohio, the fuel and gas work being under the supervision of Mr. John Blizard, fuel engineer of the Pittsburgh station. Mr. Willard D. Richardson, kiln expert, is consultant.

The crew takes data and makes observations during the first test and assumes direction of the burning of the kiln on the second test.

Three conferences of the technical staff and advisors are held with the plant managers, the first one before the first burn, then following the first and before making the second burn, and after the data for both burns are assembled. This brings to the writing of the reports the very best available knowledge both of plant experience and general technical information, a coöperation of the plant and laboratory men that should bring out the largest amount of vital information bearing on kiln economics.

FACE BRICK TESTS OF GEORGIA CLAYS

There is in Georgia a great quantity of impure feldspars and pegmatites which are unfit for use as a pottery ingredient but which, it is hoped, will make satisfactory vitrified face brick when mixed with an appropriate amount of white clay and burned to a dense body. With this idea in mind test pieces have been made up at the Ceramic Experiment Station of the Bureau of Mines, using varying proportions of several different feldspars and clays. The test pieces will be burned at several different temperatures.

BULLETINS ISSUED BY THE DEPARTMENT OF CERAMIC ENGINEERING, UNIVERSITY OF ILLINOIS, URBANA, ILL.

1. Courses in Ceramics. U. of I. Bulletin, Vol. III, No. 3, Nov. 1, 1905. None available.
2. Part 1. Purdy, R. C. and Fox, H. B., "Fritted Glazes," 1907. 45 cents.
   Part 2. Purdy, R. C. and Krehbiel, J. F., "Crystalline Glazes," 1907. 45 cents.
3. Purdy, R. C. and Moore, J. K., "Pyrochemical and Physical Behavior of Clays," Vol. 4, No. 13, U. of I. Bulletin, Mar. 1, 1907. None available,
4. Jones, J. C., "Efflorescence of Brick," 1906. None available.
5. Circular of Department of Ceramic Engineering. None available.
6. Jones, J. C., "Effect of Repeated Freezing and Thawing on Brick Burned to Different Degrees of Hardness," 1907. 25 cents.
7. Bleininger, A. V. and Moore, J. K., "The Influence of Fluxes and Non-fluxes upon the Change in the Porosity and the Specific Gravity of Some Clays," 1908. None available.
8. Bleininger, A. V., "A Study of the Heat Distribution in Four Industrial Kilns," Vol. 5, Aug. 17, 1908. None available.
9. Stull, R. T., "A Cheap Enamel for Stoneware;" Bleininger, A. V., "The Viscosity of Clay Slips," "Note on Some Fusion Curves," 1908. None available.
10. Bleininger, A. V. and Layman, F. E., "A Method Making Possible the Utilization of an Illinois Joint Clay;" Bleininger, A. V., "An Attempt to Determine the Amount of Heat Utilized from a Down-draft Kiln by the Waste Heat Drying System," 1909. 5 cents.
11. Stull, R. T., "A Cheap Enamel for Stone-ware," Part 2. 1909. 10 cents.
12. Stull, R. T., "Notes on the Manufacture of Enamel Brick with Some Investigations on Enamel Brick Slips," 1909–10. 30 cents.
13. Bleininger, A. V. and Stull, R. T., "A Study of the Vitrification Range and Dielectric Behavior of Some Porcelains," 1909–10. 20 cents.
14. Stull, R. T. and Radcliffe, B. S., "Opalescence and the Function of Boric Acid in the Glaze," 1909–10. 5 cents.
15. Knote, J. M., "Some Chemical and Physical Changes in Clays Due to the Influence of Heat," 1909–10. 20 cents.

16. Stull, R. T. and Baldwin, G. H., "Cobalt Colors Other Than Blue;" Stull, R. T., "Influences of Variable Silica and Alumina on Porcelain Glazes of Constant RO;" Radcliffe, B. S., "Investigations on the Dielectric Strength of Some Porcelains," 1912. 20 cents.
17. Bleininger, A. V. and Fulton, C. E., "The Effects of Acids and Alkalies upon Clay in the Plastic State;" Hursh, R. K., "Note on the Relation Between Preheating Temperature and Volume Shrinkage;" Hursh, R. K., "Note on the Dissociation of Calcium Hydrate," 1912. 15 cents.
18. Bleininger, A. V. and Teetor, Paul, "A Thermal Study of Boric Acid-Silica Mixtures;" Brown, R. E., "The Replacement of Tin Oxide by Antimony Oxide in Enamels for Cast Iron." 15 cents.
19. Stull, R. T. and Williams, A. E., "Investigation on Iron Ore Cements," 1913–14. 10 cents.
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21. Stull, R. T. and Howat, W. L., "Deformation Temperatures of some Porcelain Glazes;" Rand, C. C. and Schurecht, H. G., "A Type of Crystalline Glaze at Cone 3," 1913–1914. 10 cents.
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24. Department of Ceramic Engineering, U. of I. Description of Dept. Courses, and Equipment. Free.
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32. Washburn, E. W., "Refractory Materials as a Field for Research." 30 cents. None available.
33. Washburn, E. W., "The Ceramic Industries. New Opportunities for the Technical Man in the World's Most Ancient Industries," 1920. No Charge.
34. Washburn, E. W., "Physical Chemistry and Technology," 1920. 10 cents.
35. Washburn, E. W. and Libman, E. E., "An Approximate Determination of the Melting-Point Diagram of the System Zirconia Silica," 1920. 15 cents.
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39. Washburn, E. W., Navias, L., "The Products of the Calcination of Flint and Chalcedony," 1922.

40. Washburn, E. W., Footitt, F. F., Bunting, E. N., "Porosity Reprints," 1922. 35 cents.
41. Washburn, E. W., Parmelee, C. W., Hursh, R. K., "Selected Bibliography of Books in the English Language Dealing with Ceramics," 1921. 20 cents.
42. Washburn, E. W., "Physical Chemistry and Ceramics." 20 cents.
43. Parmelee, C. W., "Effect of Sulfur in Coal Used in the Ceramic Industries," 1919. 10 cents.
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46. Washburn, E. W., Navias, L., "Relation of Chalcedony to the Other Forms of Silica," 1922.
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CALENDAR OF CONVENTIONS

American Association of Flint and Lime Glass Mfrs.—April, 1923.
American Dental Trade Association—Spring Lake, N. J., June, 1923.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association, Southern Group—West Baden, Ind., November, 1923.
American Foundrymen's Association—Cleveland, Ohio, April 30–May 3, 1923.
American Gas Association—October, 1923.
American Hotel Association of United States and Canada—San Francisco, April, 1923.
American Society for Testing Materials—Place not determined, June, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.
Association of Scientific Apparatus Makers of the United States of America—Washington, D. C., April 20, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products' Association—Chicago, Ill., Third Tuesday in each month.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Manufacturers of the United States—New York City, Week of May 14, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glass Manufacturers—Place and date not determined
National Board of Fire Underwriters—New York, May 24, 1923.
National Bottle Manufacturers' Association—Atlantic City, N. J., Last of April, 1923.
National Gas Appliance Manufacturers' Exchange—Kansas City, Mo., May, 1923.
National Gas Association of America—Louisville, Ky., April 23–24, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Stoker Manufacturers' Assooiation—May or June, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

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Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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EDITORIAL

EQUIPMENT MANUFACTURERS AND MATERIAL PRODUCERS ARE RESEARCH ENGINEERS

Salesmen of ceramic materials and equipment have been styled ambassadors. They are representatives from one concern sent to another in the interest of the welfare of both. They are selling goods, hence cultivating a market for them, but the highest type of the present day salesman does more than that; he gives honest service.

The factory or house which the salesman represents has studied the requirements of the most efficient plant control and manufacturing, has devised machines, instruments, and methods, and has trained its sales representatives to demonstrate them.

The goods they sell were devised to meet a requirement rather than a demand; the demand is created by demonstration.

The inventing of a machine, device or instrument and the preparation of a material is based on a series of technical researches and the pyramiding of experiences. No machine or apparatus will find a continued sale that does not contain the most serviceable material known and which has not the proportion and design which will most effectively meet the requirements of ceramic manufacturing. The selection of the proper materials, proportions and designs requires a search through the world's accumulation of knowledge, an ability to select that which applies, and then to fabricate from the knowledge thus selected and marshalled an apparatus that will serve a given purpose.

The successful and progressive equipment manufacturer must be a research engineer with a genius for seeing the utilitarian possibilities of the bits of abstract knowledge discovered by the fundamental scientists, and he must have the ability to devise and to build them into a serviceable apparatus. The manufacturers of ceramic equipment and devices and those who find and prepare materials for use in the manufacture of ceramic wares are ceramic engineers who serve the ceramic industries just as effectively as do the ceramic engineers who are directly employed in manufacturing ceramic wares.

The fundamental scientists analyze for the purpose of finding the ultimate properties of substances singly and in combination. They are not concerned with the utilitarian possibilities of the facts they disclose. They are analysts.

Inventors are those who see the utilitarian possibilities of the facts which are disclosed by the scientist and who have the ability to create a process or equipment embodying the fundamental facts of the scientists. Synthesis is the opposite of analysis. Analysis is the taking apart and synthesis is the putting together. Inventors are our synthetic engineers.

Inventing and building are but one of the problems of the equipment manufacturer. The equipment must be installed and operated and the material must be used as a constituent in a mix. Here is where the sales ambassadors serve both the producer and the user of ceramic materials and equipment.

There are patented kilns, dryers, gas producers, furnaces, leers, pyrometers, etc., which have proven to be of economic value to ceramic manufacturers but it could hardly be expected that any one device will be equally successful under all conditions. It is rare indeed that a device does not have to be adapted to a condition. This is where the service of the sales ambassadors comes in.

The equipment manufacturer is seeking a market for that in which he has invested a large amount of time and money in construction research, and the ceramic manufacturer is seeking equipment, processes and materials that will enable him to manufacture at less cost with no deterioration in quality of ware. The equipment and material producer employs sales demonstrators and sends them to the ceramic manufacturers. He pays for space in journals wherein he aims to tell the ceramic manufacturer the advantage of using his equipment or material. This he does for his own profit but if there ever was a group of manufacturers of whom it can truly be said that "he profits most who serves best" it is the manufacturers of equipment and the producers of raw materials.

This editorial is an argument for a larger use by ceramic manufacturers of the services of the producers of equipment and materials, to study with them in an intimate fashion the problems of ceramic production, for thus

will both the producer and user of equipment and materials discover that which will be the most economical.

For legal problems a lawyer is employed; for medical problems a doctor is employed, for power problems a power engineer is employed; for chemical problems a chemist is employed. Such experts as these are paid salaries or fees. Why is it not logical to employ equipment engineers on equipment problems? Is it because they do not charge a fee unless their equipment is purchased? A study of the catalogs and advertisements of equipment producers will be without cost but it will be productive of new ideas and facts which can be profitably applied. A letter will bring a consulting service without further cost.

The equipment and material producers are ceramic engineers worthy of hire at their own terms.

PAPERS AND DISCUSSIONS

ZIRCONIA IN SHEET IRON ENAMELS[1]

By W. F. Wenning

Zirconia means zirconium oxide. Zirconium, as far as we know, is one of the elements that composes the earth. Its *chemical and physical* properties make it a desirable ingredient for ceramic products. Investigation and research have yet left a large field incomplete *for the unlimited use of zirconia* in ceramic products.

The largest deposits of zirconia have been found in South America. The deposits in this region are so vast it would compensate further research in its applicability to ceramic products.

The difficulty of transporting the ore from the field to the sea port has really made it one of the rare earth elements. From ten to fifteen pairs of oxen are required in carrying a single ton of ore over the almost inaccessible mountain road. Baddeleyite is the chief mineral of this ore whose composition varies as follows: Zirconium oxide, 75 to 94%; titanium oxide, 1 to 3%; iron oxide, 2 to 4%; silica, 10 to 20%; alumina, 1 to 4%.

This material, despite being one of the hardest substances known is pulverized to a very fine powder. This powder has a light yellowish brown appearance and can be used in enamels in this form. Most of the iron can be removed from the ore by prolonged acid digestion. This *almost iron free material* has the appearance of a light gray powder, but its composition is not otherwise changed. After this first step in refining it may be used in enamels where iron is an undesirable constituent. White chemically pure zirconia is the ultimate refined product. It may be used to obtain the desirable properties of zirconia in enamels, but its cost prohibits its commercial use. Similar properties in enamels have been effected by the use of the so-called white technical amorphous zirconia.

The composition of white technical zirconia depends on its process of manufacturing. Most specimens retain the titanium oxide, a small percentage of silica and traces of iron; while others contain small percentages of sodium and potassium oxides.

Brown and gray zirconia were adapted, respectively, to ground coat and gray mottled enamel. The smelting process of these enamels makes it possible to thoroughly dissolve the zirconia; while for white enamels it was found that white zirconia was the only form suitable as a batch ingredient. The amorphous property of the white powder caused it to be uniformly distributed if not dissolved by the smelting process.

The brown zirconia used in ground coat enamels exhibited no ill effect because of its iron content, while the high percentage of zirconium oxide in the brown zirconia displayed *its* properties sufficiently. Zirconia having

[1] Presented before the Enamel Division, Pittsburgh meeting, February, 1923.

properties similar to alumina and silica was used in place of these ingredients in ordinary ground coat enamels. A replacement up to ten per cent by zirconia in the batch changes the working property of the enamels very little, while high replacements rendered the enamel very viscous and difficult to smelt down. Enamels containing up to ten per cent zirconia were more elastic and tested to be stronger enamels with better adhesion to the steel.

Without changing the original batch formula, but adding from one to five per cent zirconia to the mill formula, the fish-scaling tendency was reduced and in one enamel crazing was overcome. Pinholes in ground coats which show up through the white cover coats are caused chiefly by impurities in sheet iron. A ground coat that ordinarily was giving good results was changed by the addition of two per cent brown zirconia to the mill formula. The pinhole defects were markedly reduced; gases or other impurities were allowed to escape or were absorbed by the zirconia.

The gray almost iron free zirconia was used and tested in gray mottled ware enamels because its low iron content did not discolor the enamel. Zirconia was also partially substituted for alumina and silica. Stronger and lighter colored enamels which showed less fish scaling were produced. Substitutions were also made for bone ash and antimony. The color through these substitutions was little affected. The enamel in which zirconia replaced the bone ash was changed after its application on the metal to a slightly darker color and the blister and rust spot tendency of bone ash enamels was eliminated. Substitutions for antimony made no change in color, but the fusibility or melting point of this enamel was slightly increased. High zirconia substitutions for silica and alumina in the gray enamel while making the color lighter had a slight tendency to produce a sunken mottle. Although the enamel so produced was not quite so smooth as the unchanged enamel its resistance to acids and heat and mechanical shock was markedly improved.

With all its other virtues, zirconia has its chief virtue in its opacifying property. This property, however, was not directly obtainable from previously mentioned brown and gray zirconia. The white amorphous powder alone was the one which could be matched against other opacifying ingredients. It was used as a batch ingredient to replace silica, alumina, zinc oxide, antimony oxide, tin oxide, and phosphates. The enamels so changed were whiter and more opaque. These same enamels when used with tin oxide in the mill formula were also whiter and more opaque and more glossy than the original enamels. Enamels in which zirconia was used in the mill formula were whiter and their opacity approached very closely to those in which tin oxide was used in the mill formula.

Zirconia used in mill formulae of low fluoride enamels produced exceptionally good opacity and whiteness. Such enamels are more acid resistant because of their low fluoride content and the added zirconium oxide.

In addition to the opacifying property of zirconia it may be summarized that enamels containing zirconia are more resistant to mechanical and thermal shock; they are more acid resistant and the zirconia in these enamels is not affected by reducing furnace heat.

CERAMIC LABORATORY
VITRO MFG. CO.
PITTSBURGH, PA. U. S. A.

PRICING AND COSTING GRADED PRODUCT[1]

BY NORMAN E. WEBSTER

In many kinds of manufacturing, mining, agriculture and other industries, the product from the same or identical operations is of varying degrees of excellence as measured by standard specifications. The differences between the grades may be in quality, in size, or in some other condition. Manufactured goods and agricultural products are often graded for quality; coal and other mining products for size. In each industry experience shows the proportions of each grade that are ordinarily obtained. Fortunately, it is usually possible, as it is always desirable, to obtain a market for the entire output, and to have the demand so balanced that the output of each grade can be regularly sold in about the proportions in which it is ordinarily produced.

In these cases the producer is confronted with the problems of price-fixing, in so far as that is within his power, and of ascertaining the costs of production as a basis for the fixing of prices or for comparison with the prices which are obtainable. The purpose of this discussion is to consider the problem of costing graded product, and to show its relation to the problem of pricing the different grades.

Two other classes of salable material should not be confused with graded product; *viz.*, scrap and by-products. Scrap is the salvaged material resulting from manufacturing processes which cannot be fabricated into the regular product without again being put through one or more of the processes to which the raw material is subjected, and when it has a market value, the net amount received for it should be deducted from the expenditure for the raw material used in the product. By-products are side lines of production in which are used residual materials resulting from the production of the principal lines. These residuals usually require further work to make them salable, and the expenditures therefor should be deducted from the selling prices to obtain the net proceeds, which amounts should be deducted from the departmental costs for materials, labor, and expenses of the regular product.

Graded product differs from scrap and from by-products in that all of

[1] Read and discussed before the Glass Division, Pittsburgh meeting, February, 1923.

it has been the object of all the productive operations. It is all regular product, though the several classes have different values, varying according to the demand for each.

In pricing different grades of product, consideration should be given to the questions of demand and of the effect which the price on one grade will have on the demand and the obtainable price for the others. Where the product is a necessity for which there is a universal demand, the prices should be so adjusted as to create demands for each class in quantities approximately equal to the quantities produced, and so that the average selling price for all classes will give a proper rate of net profit over the average production costs.

But there are other considerations to be taken into account in fixing selling prices on graded product of articles which are not necessities and for which there is not a universal demand. Manufacturers' seconds in many lines require this careful attention. The bulk of the output is usually of the first or standard grade, and in order not to unsettle the market conditions on this grade, or to cheapen the value of a trade name, it may be better policy to scrap all product not of the standard grade, or to offer the seconds at prices which will not sell all of them. In such cases, the standard grade should be priced so as to yield a proper rate of profit on the expenditure for all the product of both grades. Then if it is advisable to scrap the seconds, or to salvage the material in them, the entire line will still show the desired profit, while if a part or all of the seconds are sold, the amount and rate of profit will be correspondingly increased.

In addition to these questions of policy involved in the pricing of graded product, the costing of the different classes raises about as many accounting questions, the solution of which is necessary in order that the costs may be compared with the selling prices and thereby help to solve the questions of policy involved in pricing. Commonplace as it may sound, it seems necessary to reiterate that pricing and costing should go hand in hand.

Three methods of costing may be considered: First, that the cost is the same for each unit in all classes of the product, based on the theory that the same amounts for material and labor have been expended on each. Secondly, that the cost of each unit of the seconds is only the value of the scrap material therein, and that the remaining expenditure should be absorbed in the costs of the firsts, based on the theory that the expenditures were all made to obtain the firsts. Thirdly, that the costs of the units in each class include unequal parts of the expenditures, based on the theory that quality as well as quantity should be considered in measuring or reckoning the product, and that, therefore, units of identical dimensions or weights, but of unequal qualities, have not received equal benefit from the expenditures made for their processing.

For the purpose of considering the soundness of each of these methods of costing the product, the following illustration may be taken: Assume that a mill run of some article consists of 100 units, that 60 are firsts because they fully conform to inspection specifications, that 30 are salable seconds, and that 10 are unmarketable rejections. Assume also that the expenditures for this quantity are $20.00 for material and $80.00 for labor and overheads, that the realizable selling prices are $2.00 each for the firsts, and $1.00 each for the seconds, and that there is a salvage value of 10 cents each in the material in the 10 rejections. The account for this run exclusive of selling and general expenses will then be as follows:

Sales:			
Firsts, 60 units @ $2.00		$120.00	
Seconds, 30 units @ $1.00		30.00	
			$150.00
Cost of Sales:			
Material for 100 units:			
100 units @ $0.20	$20.00		
Less scrap:			
10 units @ $0.10	1.00		
		19.00	
Labor and Overheads		80.00	
			99.00
Manufacturing Profit (51.5% on Cost)			$51.00

The following gives a comparison of the results per unit by each of the first two methods of costing the product, losses being indicated by an asterisk after the amount or percentage:

Method	Grade	Price each	Cost each	Profit each	Total profit	% Profit on cost
First,	60-1sts	$2.00	1.10	0.90	54.00	81.8
	30-2nds	1.00	1.10	0.10*	3.00*	9.1*
Second,	60-1sts	2.00	1.60	0.40	24.00	25
	30-2nds	1.00	0.10	0.90	27.00	900

In examining the results of the first method, we should remember that the aim is to produce the greatest possible proportion of units of the first or standard grade, and that business policy might make it inadvisable to market any seconds. In that case, the total expenditures less the salvage value of the materials in the 30 seconds and the 10 rejections, or a net amount of $96.00, would be charged to the production of 60 firsts, making the cost $1.60 each, but although the comparative table shows that, by the first method of costing, there is a profit on the firsts of 81.8% on cost, the total profit of $51.00 can only be secured by selling all of the seconds at a loss of 9.1% on cost. Profits are not made out of losses in that way, and the first method is therefore unsound in economics.

The second method results in showing a profit on the firsts of 25% on cost, and this is not dependent upon the sale of the seconds. By this method, the cost of the seconds is computed at only the salvage value of the material in them, and yet the price obtained is largely in excess of the salvage value. The reason is that in addition to the material, the seconds possess value as a result of the labor and overheads which have been expended. Having received a portion of the benefit, they should be charged with a proper proportion of the expenditures and not be relieved of them as are the rejections which have not been so benefited.

The error in the first method is in not distinguishing between expenditures and costs. Expenditures are an element of costs of which the other factor is product. By assuming that expenditures are identical with costs, the former would have to be permanently allocated to each article as the material was set apart for it and the labor was applied to it, and this would result in making each of the ten rejections cost the same as each of the firsts and seconds. The error in the second method is in not recognizing that in the production processes the seconds received some of the benefits of the expenditures for labor and overheads, though in less degree than the firsts.

The third method is based on the varying degrees of benefit applied to the different grades of the product. What these are cannot be ascertained during the manufacturing processes. They are not subject to count, or to measurement by the yard stick, peck measure or scales. But they are measurable in another way which is by the prices at which the different grades can be sold. These prices provide a basis for converting the quantities of all grades into some common standard which, for convenience, should be that of the first or standard grade. Each second is equal in quantity to that fraction of a first which is represented by the price of the second divided by the price of the first.

Applying this method to the illustration already used, the result is as follows:

Method	Grade	Price each	Cost each	Profit each	Total profit	% Profit on cost
Third,	60-1sts	$2.00	1.32	0.68	40.80	51.5
	30-2nds	1.00	0.66	0.34	10.20	51.5

This method, therefore, shows 51.5% profit on both the firsts and the seconds; that is, the average rate for the entire mill run as shown in the original statement of the transaction. If now, after thus costing the two grades of product, it is found that not all the seconds can be sold at the proposed price, or if it is considered inadvisable to market them all, then the average rate of profit will be reduced pro rata, depending upon the number of the seconds that are scrapped. Thus, instead of 51.5% profit when all seconds are sold, the rate will be 42.9% if ten seconds are scrapped, 34.2% if twenty seconds are scrapped, and 25% if none of the seconds

are sold, this being the lowest rate of profit that the run can show if all the firsts are sold at the regular price of $2.00.

Properly computed costs on graded product are helpful to the executive in determining manufacturing and sales policies, while costs computed on erroneous bases of distribution may lead to the unsettling of market conditions if not to more serious consequences.

NILES AND NILES, CERTIFIED PUBLIC ACCOUNTANTS
111 BROADWAY
N. Y. CITY

DISCUSSION

CHAIRMAN HOSTETTER:—As one gets into production and realizes the ramification of expenditures and costs it seems hopeless at times to know whether a new process is a success or not.

E. W. WASHBURN:—I would like to ask a question in regard to a point which the paper did not touch upon, that is the cost of process development. Are there any principles which are worked out for handling this cost, as to the number of years it is spread over and so forth?

N. E. WEBSTER:—You mean the development of a process prior to the stage where it produces a marketable product?

E. W. WASHBURN:—Yes.

N. E. WEBSTER:—That is one of the many phases of cost accounting which were not even touched upon in the paper on costing graded product. Development work may be done for the purpose of producing a patentable mechanism or process or formula. It may be done for the purpose of devising equipment or methods which will not be patentable but which through secrecy or otherwise can be temporarily reserved for the benefit of those who developed it. The development work may all be prior in time to the use of the resulting process, or it may be carried on for a considerable time and the results may be utilized in the current productive operations.

Every live progressive organization will try to improve methods and to obtain immediate benefit from the improvements made. The expenditures for the ordinary development work of that kind may not be susceptible of segregation from the purely operating expenses, and inasmuch as they are usually not large in proportion, they should be included in the current costs. Each period benefits from the results of the expenditures made during earlier periods and pays for such benefits by its contributions toward the future.

However, if the development work is not the ordinary improvements but the process is to be completely developed before it is used in production, the expenditures should be excluded from the current costs and should be treated as deferred charges, which may at once be written off against

the surplus or may be carried on the balance sheet as suspense items. Later when the development work is completed and the process is shown to be successful, the suspense items may be transferred to the capital assets if the process is secured by patent protection or they may be treated as deferred charges for absorption in the subsequent costs during a stated period which should be a conservative estimate of the time during which benefits will be derived from the process.

E. W. WASHBURN:—Are there any principles for determining over what period of years amortization should be applied?

N. E. WEBSTER:—Each case should be studied separately. However, if there is patent protection for the use of the process, the period may be for seventeen years. If the usefulness of the process is limited to a shorter period by contract arrangements or by anticipated progress of the art which may make the process obsolete, the period for amortization should be shortened accordingly. If the process is not protected by patent, the period for amortization should not extend beyond the earliest date when it may cease to be of value in the productive operations. There is no standard rule except that the treatment should be conservative so as to avoid carrying deferred charges on the balance sheet after they have become valueless to the business.

NOTES ON BURNING REFRACTORIES WITH SPECIAL REFERENCE TO THE CONTROL OF LABOR COSTS[1]

By L. C. HEWITT

ABSTRACT

The tunnel kiln represents up-to-date practice. It is often possible, however, to greatly increase the efficiency of present equipment by keeping in mind the importance of such factors as the setting of dry ware, regular inspection of underground flues, provision for ample grate and flue area, use of burning records, study of vitrification curve, etc.

While the above factors are treated rather generally, more specific reference is made to the control of labor costs through the bonus system. A theoretical problem is worked out to show how the bonus system is applied and in what manner it benefits the employer and employee.

Introduction

Object in Burning.—In burning refractories, high quality ware is, of course, the paramount object to be secured, whether it is kiln design, burning schedule, kind of coal, type of setting, or whatever the particular burning phase may be that is up for consideration. The next object is to obtain this high quality ware at the lowest possible cost.

Tunnel Kiln up-to-date Method.—While the tunnel kiln is, no doubt, soon to come to the front as the most efficient method of burning certain

[1] Presented before the Refractories Division, Pittsburgh meeting, February, 1923.

types of refractories, due to nicety of control, reduced firing labor and handling costs, lower fuel consumption, quick turnover, and higher percentage of first quality ware that such a unit carries with it, it is to be recognized that there is to be no sudden change from present equipment over to this up-to-date method. Production must be continued during such a transition and such factors as plant layout, financial situation, etc., may make a change from present burning equipment in some plants practically prohibitive.

Increased Efficiency Possible with Present Equipment.—It is oftentimes the case, however, that it is possible to obtain greatly increased efficiency from the present equipment through slight changes in design, method of firing, type of setting, etc.

Inasmuch as the control of burning labor is the chief object of this paper, only brief mention will be made of other factors having an important bearing on increased burning efficiency. It is assumed that this industry, as a whole, is largely equipped with some form of the down-draft periodical kiln. While these other factors that will be mentioned are generally known, some of them are often overlooked in the daily routine of plant operation.

General Factors Having Bearing on Burning Efficiency

Set Dry Ware.—It cannot be emphasized too strongly that ware should be dry when it is set. Wet ware means longer burning time, with the tying up of costly equipment and it is often attendant with a lower quality product. It is very seldom that the kiln is an efficient dryer.

Inspect Flues Regularly.—Another important factor, which is often overlooked, is the provision of regular inspection of the underground flues and ducts. It takes draft to burn a kiln and up to a certain limit we can almost safely assume that the burning time is proportionate to the draft. This is particularly true in the water smoking stage, when the entire object is to relieve the ware of its moisture content. Fallen brick from the flue arch, the collection of setting sand, etc., reduces the flue area and hence the draft.

Size of Stack Flue Important.—The size of the flues connecting kiln and stack should also be carefully measured and compared to the area of the kiln bottom flues which feed them, for the effective flue area is no greater than the neck of the bottle in the circuit. The cost of tearing up and enlarging the stack flue is often very small in comparison to the benefits to be derived. Get them too large rather than too small; it takes only a minute to lower the stack damper if the draft is too strong.

Kiln Design.—A discussion of kiln bottom design, type of grates, etc., are subjects which cannot be properly treated in a general discussion. In brief, here again, the grate area should be too large rather than too

small and care should be taken in the floor design that the draft will be evenly balanced. The writer favors some type of so-called open bottom.

Burning Schedule and Records.—The pyrometer is, of course, an invaluable aid in working out and controlling the burning schedule. The vitrification curve of the particular fire clay used can also be employed to good advantage in this problem. If the shrinkage and porosity curve shows that there is little change in the clay over a rather wide range in temperature, and if ware can be secured which possesses the necessary strength, etc., by burning to a lower point of the curve in which the vitrification has been stabilized, often times considerable fuel and labor can be saved by thus limiting the vitrification period. Again, the vitrification curve may show that the burning is not being brought along to the extent that it should in order to relieve the ware of its fire shrinkage.

It is also well recognized that detailed records should be kept of each and every burn so that an analysis may be made of the factors which are conducive to high quality ware at low cost.

Controlling Labor Costs.—Passing on from these general notes, a more detailed reference will be made to the control of firing labor, it having been the writer's good fortune to have spent several months in working on this particular phase of burning in conjunction with Dwight T. Farnham, Industrial Engineer. The January 25th issue of *Brick and Clay Record* of 1921 contained an article by the writer on "Putting the Kiln Firemen on Bonus." Since the Program Committee of the Refractories Division were desirous of presenting a symposium of burning refractories at this time, and since the publications of the SOCIETY do not treat in detail this particular method of controlling burning labor, the *Brick and Clay Record* have kindly assented to the use of the subject matter of that article in this discussion.

Putting the Kiln Firemen on Bonus

Time Study Basis of Labor Standardization.—In working out a bonus system, there must be labor standardization and to standardize properly labor, time or motion study must be employed. Briefly speaking, time study consists of analyzing a job, breaking it up into its component parts, determining the time necessary for the accomplishment of each element, and then combining the results; unnecessary movements are brought to light and methods at once suggest themselves for increasing the efficiency of the task.

Benefits Derived from Bonus System.—But what is to be gained by this so-called time study and labor standardization? The answer is mutual benefits to employer and employee. The employee increases his earnings by receiving a bonus, while the employer increases his profits through more efficient operation.

Working out the Bonus System: Theoretical Problem

Kind of Kilns.—Turning to the method of putting the kiln fireman on bonus—let us first take a walk through the factory; let us assume that we find the yard equipped with nine kilns, six of which are of the round down-draft type and three of which are of the rectangular down-draft type, and that in respect to fire holes we find them classified as outlined in Table I. It is concerning these facts of which we first wish to inform ourselves, since the labor required for firing a certain kiln is dependent upon the number of fire holes. That is granting that the fire holes are evenly spaced, of the same size and kind, it will obviously take twice as long to fire ten fire holes as it will five, etc.

TABLE I

KILN CLASSIFICATION

Kiln no.	Kind of kiln	No. of fire holes
A	Round	8
B	Round	8
C	Round	8
D	Round	9
E	Round	10
F	Round	10
G	Rectangular	18
H	Rectangular	20
I	Rectangular	22

NOTE: The types of kilns and conditions named in this article are purely hypothetical—being used merely to illustrate the case.

Firing Labor Operations.—Now turning to the duties of the firemen, we find that they are divided into the following component labor operations:

1. Placing of kindling wood and coal in fire boxes preparatory to lighting.
2. Firing of kiln at stated intervals.
3. Cleaning of fires and removing ashes.
4. Miscellaneous—such as taking trials, temperature readings, daubing of crown holes, etc.

Relation of Labor Operations to Kiln Temperature.—Since it is evident that the work becomes heavier as the kiln gains in temperature and that this condition at once gives us a basis for setting the Labor Standard, it is next necessary that we determine the relation between the labor operations and the progress of the kiln. Let us assume that the type of ware burned permits the kilns to be put under high fire at 72 hours, the burn being finished in 120 hours, and that the major operations of firing are tied in as outlined in Table II.

Actual Time for Each Labor Operation per Fire Hole.—Thus far we have analyzed the job and broken it up into its component parts. Our

TABLE II

LABOR OPERATIONS PER STAGE OF BURN

Shift	Hours under fire	Temp. F	No. times fired	Frequency and kind of cleaning	No. loads ashes per fire hole
1st Night	12	160	5	"Shaking bars slightly"	...
Day	24	250	6		...
2nd Night	36	500	8		...
Day	48	800	12	Use hook once	0.7
3rd Night	60	1150	12	Use hook once	0.6
Day	72	1400	12	Use spade once	1.0
4th Night	84	1600	12	Use spade twice	1.4
Day	96	1800	12	Use spade twice	1.4
5th Night	108	2000	12	Use spade twice	1.4
Day	120	2150	12	Use spade twice	1.4

next step is to take the stop watch and determine the time necessary for the completion of each element of the task, which we may find to be as shown in Table III.

TABLE III

ELEMENTARY TIME STUDIES

Base, one fire hole, time given in minutes for each occurrence of firing or cleaning

Shift	Flat arches		Removing ashes
	Firing	Cleaning	
1st Night	1.0	...	....
Day	1.0	...	....
2nd Night	1.0	...	....
Day	1.0	5.0	8.5 minutes per load
3rd Night	1.0	5.0	
Day	1.5	6.5	
4th Night	2.0	8.0	
Day	2.0	8.0	
5th Night	2.0	8.0	
Day	2.0	8.0	

We can now combine the results given in Tables I to III since we have the main facts necessary for determining the Labor Standard. For instance, if we wish to know the time required for firing one fire hole during any one shift, we need only to multiply the time required for one fire by the total number of fires made; the time required for firing one fire hole during the fourth day, is found by multiplying 2 (see Table III) by 12 (see Table II). Likewise we find that the time for cleaning fires on this day is 16 minutes and that removing ashes takes 12 minutes. By applying this method throughout the burn, we obtain the results shown in Table IV.

Fatigue Allowance.—To permit a 50% fatigue allowance, it will be noted that the total man minutes shown for any one shift has been multiplied by 2. This allowance is purely assumed for this particular case, as no arbitrary figure can be set to cover all plants, but as kiln firing is very

TABLE IV

COMBINATION OF TIME STUDIES

Time in minutes—base one fire hole

Shift	Hrs. under fire	Temp. F.	Time for firing	Time for cl'n'g fires	Time for rem'g ashes	Total man minutes req'd.	Total man minutes req'd. × 2
1st Night	12	160	5.0	..	..	5.0	10
Day	24	250	6.0	..	..	6.0	12
2nd Night	36	500	8.0	..	..	8.0	16
Day	48	800	12.0	5.0	6.0	23.0	46
3rd Night	60	1150	12.0	5.0	5.0	22.0	44
Day	72	1400	18.0	6.5	8.5	33.0	66
4th Night	84	1600	24.0	16.0	12.0	52.0	104
Day	96	1800	24.0	16.0	12.0	52.0	104
5th Night	108	2000	24.0	16.0	12 0	52 0	104
Day	120	2150	24.0	16.0	12.0	52.0	104

heavy and hot work, a considerable period of rest must be allowed if the men are not to be overtaxed. This fatigue allowance also covers such miscellaneous duties as daubing crown hole covers, taking trials, etc.

Application of Standards to Each Class of Kiln.—Our next process is to apply the standards obtained per fire hole to each class of kiln. This procedure is outlined in Table V.

TABLE V

APPLICATION OF COMBINED TIME STUDIES FOR ONE FIRE HOLE TO AN 8 FLAT GRATE FIRE HOLE, ROUND KILN (NOS. A, B AND C.—SEE TABLE I)

Shift	Hours under fire	Temp. deg. Fahr.	Man min.[1] req'd including fatigue	Man min. reduced to man hours	Standard no. man hours selected
1st Night	12	160	80	1.3	2
Day	24	250	96	1.6	2
2nd Night	36	500	128	2.1	2
Day	48	800	368	6.1	6
3rd Night	60	1150	352	5.8	6
Day	72	1400	528	8.8	9
4th Night	84	1600	832	13.8	14
Day	96	1800	832	13.8	14
5th Night	108	2000	832	13.8	14
Day	120	2150	832	13.8	14

[1] Found by multiplying the minutes set for one fire hole (right hand column Table IV) by 8, the total number of fire holes.

In order to make the scheme as simple as possible, standards have been set to cover as wide a range of the burn as the circumstances permit. (See right hand column Table V.) The Labor Standard for an 8-fire-hole kiln is then 2 man hours from start of burn to 500°, 6 man hours from 500° to 1150°, 9 man hours from 1150° to 1400°, and 14 man hours from 1400° to finish of burn.

By applying this method to the various kilns listed in Table I we obtain the standards shown in Table VI.

TABLE VI

STANDARD MAN HOURS PER 12 HOUR SHIFT—PER STAGE OF FIRE

Kiln numbers	Temperature range 0–500	500–1150	1150–1400	1400-fin.	Standard man hrs. for lighting[1]
A-B-C	2.0	6.0	9.0	14.0	2.0
D	2.0	7.0	10.0	15.5	2.5
E-F	2.5	7.5	11.0	17.5	3.0
G	4.0	13.5	20.0	31.0	5.0
H	5.0	15.0	22.0	35.0	6.0
I	4.5	16.5	24.0	38.0	7.0

[1] Determined from actual time study.

It will be noted that in a number of instances the standards call for as low as 2 man hours or $^1/_6$ of a man. But how can we dispense with the services of part of a man? This, of course, cannot be done—but the standards adjust themselves when there are a number of kilns on fire. If kiln D was in the 2nd stage and kiln H was in the 1st stage, the total standard man hours would be twelve, or one man. There would be times, undoubtedly, when the standard would not call for an even number of men, but the scheme works out very well on an average. If the total standard of all kilns on fire called for 23 man hours, 2 men would necessarily be needed, while again if the standard called for 25 man hours, two men could still do the work and would then be over 100% efficient. It is a give and take proposition.

Flexibility of Standards.—Standards set as above can be applied to other burning schedules than the one from which the standards were deduced; *i. e.*, if on account of wet tile, it was not safe to reach 500° until after 48 hours had elapsed instead of 36, we would still use the labor standards for the range 0–500°.

Standards Once Set Should not be Changed.—It is to be remembered, however, that the success of the bonus scheme as a whole, is necessarily dependent upon the correctness of the standards set—which correctness, is in turn, dependent upon the man who sets the standards. This man who must be thoroughly grounded in the fundamentals of time study, should be capable of judging in his own mind whether the worker, whom he is timing, is doing a "fair day's work." Obviously, we would not set standards based upon the movements of the most efficient worker in the crew, any more than we would set standards based upon the least efficient; neither would we attempt to set the standard time for a given task until we had repeatedly timed the operation and assured ourselves that no stone had been left unturned in arriving at our conclusions. If the bonus system is to retain the mutual respect of company and men—standards once set

should *never* be changed unless conditions are changed—therefore the importance of correct standards.

Reward to Labor.—Turning again to the calculation; since we have now established a standard labor schedule how shall the firemen be rewarded for attaining this standard? We might base their premium on either a 10, 15 or 20% bonus curve, depending upon the attendant circumstances. Let us select the 15% curve as the standard in this particular instance.

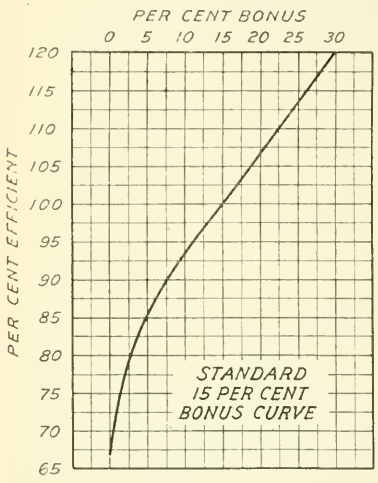

FIG. 1.

On this basis then each fireman will receive 15% additional wages for obtaining standard or being 100 per cent efficient. If only 90% efficiency is attained the bonus would come to 7.5%. A comparison between various efficiencies and bonus reward is shown in Figure 1.

How Company Gains.—The above procedure takes care of the fireman, he can increase his earnings 15% without undue exertion—but how about the company? Experience has shown that on most unstandardized work, labor efficiency approximates 70%. On this basis then, to reach standard—the firing force must consist of 7 men where there were ten—or in other words the force must be cut 30%. The company then will accordingly reduce its gross labor bill for firing 30%, paying out 70 cents where it spent $1 before. As against this saving of 30%, the company must pay a bonus of 15 per cent, on each 70 cents paid for labor or 10.5 cents. The total labor bill will then be 80.5 cents instead of $1, and the company will have realized a net saving of 19.5%.

It is also desirable in connection with the labor bonus to pay the firemen an additional bonus for attaining standards set on burning time, coal consumption and quality of product. We then have an ideal method for basis of payment, the reward is in proportion to accomplishment, the the fireman has been set up in business for himself, as his interests are identical with that of the company—namely to produce the highest quality ware, burned in the shortest time, with the least amount of coal and with the least amount of labor possible.

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DISCUSSION ON "THE AMERICAN INTEREST IN CHINESE ART"

FREDERICK H. RHEAD:—The American interest in Chinese art is largely a collectors' interest, but more fundamentally, it is a students' interest.

China, in common with Greece, Persia, Italy and Japan, is one of the relatively few countries which has developed a national style of art which has been the inspiration to artists and craftsmen in most other countries.

The United States has not yet developed a strictly national style, although we are developing a school of architecture that is distinctly American. Our skyscrapers are responsible for this, but we are to a great extent following the European countries in drawing on Grecian, Renaissance, Gothic—and in the West, Spanish styles and adapting these to our own needs.

Owing to the peculiar construction of Chinese and Japanese architecture neither of these has been an influence in this respect. China and Japan are the only nations in the world where the capital, the principal ornamental feature of all other architectural styles, is unknown. But so far as bronzes, porcelains, jades, crystals, embroideries and ornamental detail are concerned, the Chinese designers and craftsmen have produced work which has influenced the Occidental artists and craftsmen, just as our architects have been influenced by the other periods named.

It is easy to understand that a country with no great national art will turn to those countries possessing distinctive types, and in the search for inspiration, the artists and sculptors will be influenced by the various masterpieces irrespective of their original source.

The period of growth, the highest point of development and the inevitable decline of a particular style has generally occupied a space of something like four hundred years. We find the greatest period of the Grecian vase development to be in the fourth century, B.C., the Della Robbia majolica vase about 1438, and the K'ang-shi period in China 1662–1722.

In all these great developments there is ample evidence that the activity has been under the protection of the reigning potentate, or subsidized by the respective government. A national interest, or a powerful individual interest in an art or science is bound to be productive because the means are provided to bring about the necessary development. As the Royal Sevres, Berlin and Copenhagen factories could not produce their fine works if France, Germany and Denmark did not contribute towards their support, it is very definite that the great historical art and architectural works would not have been produced if the reigning monarch of the period was not personally interested.

In China a revolution always resulted in an interruption in connection with her artistic development.

In the United States we have evidence of the necessity of subsidized or protected activities in the arts. It is only necessary to refer to the

various symphonic and operatic organizations. The big schools, libraries, and the museums must be endowed, and even our own Rookwood Pottery could not have continued its existence if it had not been liberally supported for a number of years before it became self-supporting. Then again, we need a Woolworth to build an epic in sky-scrapers, and a Stanford White to build a Madison Square Garden, one of the finest pieces of Renaissance architecture in this country.

The United States is awakening to the need of national art development, and is only following the steps of England and other European countries in turning to the great classical styles of Greece, Persia, China and Italy for inspiration.

Various artists seek different inspirations, interpreting these according to their individualistic skill and ability.

In the ceramic world, we find practically in the same period, Wedgwood using the Grecian motifs, while a number of the English porcelain manufacturers are copying the Chinese.

In the same way our artists and craftsmen are reaching out for the best that has been produced in other countries with the result that in course of time we will have absorbed what has been done before, and will consciously or unconsciously develop a great historic style of our own. In fact, we are already doing this.

New York at this time is admittedly the center of art in the world; chiefly because it is the greatest art market in the world, but also because of building activities such as the world has never known before. And all the arts are subsidiary or subordinate to that of architecture.

In looking for the best art work that has been done by other countries, we cannot as stated follow China in regard to architecture, but we can and do follow her decorative styles. The St. Louis Exposition of 1904 and the San Francisco Exposition of 1915 have no doubt been responsible for an increased popular interest in Chinese art, but the intellectual interest dates back further than this.

It dates back to the beginning of the growth of big business when individuals who had amassed great fortunes found the time to collect, and discovered the need of ownership of fine works of art.

Art is one of the great essentials of desirable human existence. Even the primitives discovered this. Directly the American business man developed his industries to the point where they are no longer individual activities, he would have the means and the time to acquire beautiful things for his surroundings.

That Chinese porcelains, rugs, jades and embroideries would be included is obvious, and it is equally obvious that the acquisition of such works by the wealthy would create a vogue or style which would be more or less popular among the general public.

This interest is reflected not only in connection with objects of art, but it is seen in the theater, the photoplay and in literature.

However, this national interest in foreign art is not permanent, or at least it is not to be the dominating influence. This country is too large and has contributed too much to the development of human accomplishment to be lacking in material, subject and epic for the artist, sculptor, craftsman and writer.

DISCUSSION ON "CAUSES OF BULGES ON STRUCK-OFF FIRE CLAY SHAPES"[1]

What is the cause of bulges or bellies upon the struck-off face of fire clay shapes molded by hand in wooden molds and not repressed, and what is the remedy for same?

E. H. VAN SCHOICK:—It may be that this trouble is peculiar to our plant; we find that we have lots of trouble in making the simplest kind of a fire clay shape, as much as we do the most difficult one. About the simplest fire clay shape you can make would be a cube, say 10 or 11 inches square, and we find when we mold that shape by simply throwing the clay into the mold, and after that shape is dry, it will have a bulge on the side where it has been struck off, and after it is burned, the bulge will be still more pronounced. We have tried certain ways of remedying that, in our own plant, none of which has ever proved satisfactory except in certain particular cases. I was wondering if there was something radically wrong with our general method of molding these shapes.

To my mind, the cause is a greater density of clay through the center; we have endeavored to prevent this by hollowing out the center, deliberately hollowing it out, on one particular shape that we made. This was a shape for a flat arch. If you can hang your brick so that the bulged face only goes to the back, then you will get a tight joint, even if one face is bulged a little, because the other face will be slightly concave, but in those cases where the brick hang back to back, it causes a very pronounced opening in the arch. We hollowed out the clay on the top of the mold and filled up the hollow space with white sand. After it had dried, we had a hollow of $^3/_{16}$ of an inch deep in the top of a brick which did not measure over 10 inches across. After these brick were dried enough they were set back to back and when they came out of the kiln they were perfectly straight, with the dimensions through the center the same as the outside. It would seem that there is a greater density of the clay through the center.

F. TALBOT:—I think he is on the right track to prevent this trouble, that is, to concave one surface of the tile.

E. H. VAN SCHOICK:—Some of the men in our plant thought it was be-

[1] Discussion on Question R-26 at St. Louis Meeting, February, 1922.

cause the tile dried out faster on the top. The tile is put onto the floor on the struck-off face. We tried turning the tile onto its side, but no matter how we handled it after the tile was made, we always got the bulge.

F. H. SCHWETYE:—We have that same trouble at times, and we think it is caused sometimes by improperly making up grog and also by slicking cut off surface of tile.

We have taken tile which showed a bulge after it was burned, and broken it and found a void inside. This we attributed to poor molders, who made up grog improperly. Other tile that showed a bulge were solid and as sound as it would be possible to make them. We found these bulges due to slicking top of tile after cap was cut off.

We overcame this trouble by discontinuing slicking the cut off side. Instead of slicking we cut off the cap and branded the tile. We placed a convex board on top of tile, raised $^1/_{16}$ to $^1/_8$ inch depending on size of tile, and struck board with a mallet. We found this would overcome the bulging. When handling a fairly heavy tile this way we filled the hollow space with sand before turning out of mold onto offbearing or drying board.

We have most of our trouble with mixtures containing a large per cent of plastic clay, a fairly dense product. There is a resiliency to plastic clay when wet. You can compress it slightly when slicking causing body of clay near surface to be moved from its original position, and when slicking plane is removed you will leave a greater volume of clay in one spot than in another, causing bulge. The tile retains this shape through drying and burning. We still have the trouble and we have attempted to remedy it the same as you have by making the bottom slightly convex and also by putting it onto a block and putting sand on it.

A. F. GREAVES-WALKER:—Could this difficulty be due to slicking? When you run the slicker over the mold you in a measure compress or tend to compress more clay into the mold than it will hold. The clay mass will be compressed slightly as long as the slicker is on top but as soon as the slicker moves off the resiliency of wet clay will allow the clay mass to recover most of its original volume.

F. H. SCHWETYE:—We found that to be true. We overcame it by trimming the tile off. We cut it off but did not slick it, and then placed the convex surface of the board on top of the tile. In slicking you increase the pressure on your clay and its resiliency causes the clay to come back to its original shape.

E. H. VAN SCHOICK:—We have used the same remedy. Where we slicked the tile with water, we now simply cut them off and place the tile onto a slightly convex board; thus a slightly concave surface is obtained on the tile.

F. H. SCHWETYE:—We have that trouble, only with some clays, not all of them.

MR. GREAVES-WALKER:—The trouble seems to be more with the plastic clays than with the non-plastic, which indicates that it is due to the resiliency of the clay.

A MEMBER:—Would it do any good to vent the shape, say by puncturing the tile after it had been formed? If the bulging was due to gas, it might be remedied by allowing the gas to escape.

E. H. VAN SCHOICK:—We punched our tiles full of all kinds of holes.

A MEMBER:—In tiles that have been slicked, it will be found in many cases that the trowel has forced the coarse particles down to a depth of three-sixteenths of an inch. That portion at least, is of much finer grain than the rest of the tile. When you get coarse and fine materials, you are going to have a difference in shrinking and burning. Take the other side of that, where it has been put on a mold, and you will find that the bottom instead of being of dry material, in that wet mold the coarse will go to the bottom and that gives a tendency to the entire tile to bulge. Additional troweling that the molder often does in finishing it up to make it nice and smooth to look at, forces the coarse part away from the top.

A. F. GREAVES-WALKER:—We run across that difficulty sometimes in the manufacture of magnesite shapes, but it usually occurs when the material is a little too wet. When he has not a perfectly flat surface, the molder takes his fingers and presses out a small amount of material; sometimes he does that twice, and eventually brings it down to a perfectly flat surface, showing that it is caused by too much material.

E. H. VAN SCHOICK:—We use a large proportion of plastic clay in our tile.

A MEMBER:—In using the open burning clays in Northeastern Kentucky we never had any trouble like that at all, but in using some very plastic Indiana clay we have had it and sometimes it causes a great deal of trouble. Can it be that this is possibly due to the expansion of some colloidal matter in the clay? In making up some test bricks of some plastic coal mine clay, I noticed when we tried to mold this mud, it would expand to such a degree that it was almost impossible to get the shape wanted. It seemed to me there was some material there that was expanding.

A. F. GREAVES-WALKER:—I don't know whether we have suggested anything to Mr. Van Schoick that will clear the atmosphere for him or not, but he at least knows that he is getting as good results as the rest of us. There are but a few ways to overcome this difficulty and he probably has them.

DISCUSSION ON THE "MEANING AND MICROSCOPIC MEASUREMENT OF AVERAGE PARTICLE SIZE"[1]

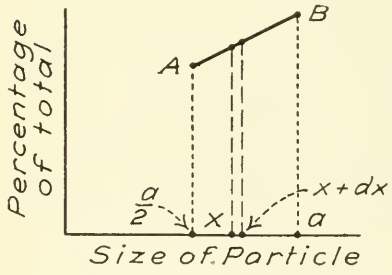
J. C. PEARSON:—This paper should be of considerable interest to those concerned in any way with the properties of finely divided materials, es-

[1] Perrott and Kinney, *Jour. Amer. Ceram. Soc.*, 6 [2], 417–39 (1923).

pecially to those who are interested in methods of determining the gradation of powders too fine to be handled with sieves. The discussion of the meaning of average particle size is a valuable contribution, and the general mathematical treatment will be an aid to many who have tried to interpret the results of mechanical analyses.

The authors have done well to emphasize that the sizes or diameters of irregular particles are wholly arbitrary when one wishes to express and use these quantities in such way as to bring out certain characteristics of a large group of particles as a whole. As this fact is indisputable, it is sometimes convenient and permissible to make certain simple assumptions in regard to shapes and sizes of particles that lend themselves readily to mathematical treatment. Thus one may frequently arrive at an approximate result with a small fraction of the physical and mental effort that he would otherwise be put to.

The question in which the writer is particularly interested is whether the microscopic analysis is, after all, as simple, easy, and satisfactory a method as air elutriation for arriving at the specific result desired by the authors, namely an average particle size of pulverized coal such that one-half the weight of the material consists of particles coarser than this size, and one-half finer than this size. The thought which gave rise to this question was that in the studies of fine aggregates for concrete, we are accustomed to use sieves the openings of which form a geometric progression, the standard methods for sieve analyses of such materials specifying the use of sieves No. 100, 50, 30, 16, etc., in which the constant ratio of 2 is maintained between the openings of the successive sieves. This standard has been adopted by the A.S.T.M. on the general belief that for most purposes the gradation of a fine aggregate is sufficiently well determined by these particular sieves. Assuming this to be true, it is obvious that the computation of "fineness modulus" or "surface modulus," or any other factor based on the mechanical analysis of a graded material is greatly simplified by the simple ratio of sizes which exists between the successive fractions.



As an illustration of this last statement let us find an expression for the number of particles of a graded material passing a given sieve and retained on the next finer sieve of the series.

In the diagram let A and B be two points on the mechanical analysis curve of a graded material, the ordinates of A and B representing the percentages of the total sample passing any two successive sieves, and the abscissae representing the sieve openings, which may be designated as a

and $a/2$. Then the straight line AB is an approximation to the portion of the true sieve analysis curve between A and B, and is the *actual* curve if we assume an even gradation of particles in this fraction.

Let M = total mass of particles between the two sieves and dM = mass of particles with diameters between x and $x + dx$.

$$\text{Then } \frac{dM}{dx} = \frac{M}{a - \frac{a}{2}} = \frac{2M}{a} = K \text{ a constant.} \qquad (1)$$

Let dN = number of particles with diameters between x and $x + dx$. Then $dN = \frac{dM}{mx}$, where mx = mass of particles of diameter x.

Assuming the particles to be spheres, $mx = \frac{\pi \rho x^3}{6}$. From (1) $dM = K dx$,

$$\text{Hence } dN = \frac{K dx}{\frac{\pi \rho x^3}{6}} = \frac{6K}{\pi \rho} \cdot \frac{dx}{x^3} \qquad (2)$$

Integrating (2) between the limits a and $\frac{a}{2}$ we get $N = \frac{9K}{\pi \rho a^2}$. Substituting for K from (1)

$$N = \frac{18}{\pi} \cdot \frac{M}{\rho a^3} = 5.73 \frac{V}{a^3} \qquad (3)$$

where N is the total number of particles between the sieves and V is the absolute volume of the particles, which in the case of a homogeneous material is proportional to the weight of the fraction.

Hence under the assumptions made, the number of particles between two consecutive sieves is proportional to their combined weight and inversely as the cube of the openings of the sieves. Equation (3) is of course an approximation to the truth, but possibly near enough for practical purposes. The important thing is that equation (3) holds for every fraction obtained in the sieve analysis, and consequently serves to give a very simple estimate of the total number of particles in a given sample of graded material.

The purpose of this somewhat detailed reference to the advantages of a sieve analysis in which the sizes of separation form a geometric series with a simple ratio of 2 is to suggest that these same advantages are maintained in any sort of a mechanical analysis based on the same ratio of sizes, no matter what methods or what materials are used. Thus in the cement testing laboratory at the Bureau of Standards the air elutriator referred to by the authors has been so adjusted as to give nominally sizes of separation of 40, 20 and 10 microns, these fitting approximately into the geometric series of openings of the testing sieves referred to above. If

pulverized materials for which elutriation methods are applicable are so graded that not too great a proportion of the particles are of nearly the same size, or in other words, if the component particles are well graded in the sense that we speak of a sand for mortar or concrete as being well graded, their properties and characteristics ought to be thus determined as well relatively as are those of fine aggregates by the standard methods of sieve analysis.

It has been interesting therefore to see just what result would have been obtained from elutriation methods alone for the average particle size of the sample of coal used by the authors to illustrate their method of microscopic analysis. In order to do this, it is necessary to assume that the percentages of the several sizes of coal particles as given in the last column at the bottom of page 432 represent approximately the true mechanical analysis of the sample, whether these were obtained by microscopic analysis or by elutriation methods. From the figures given we find the following distribution of sizes:

10 microns	12.6%
20 microns	16.8
40 microns	33.2
60 microns	37.4
Total	100.0%

The number of particles in each of these groups is, as indicated in the previous discussion of sieve separations, proportional to the percentage by weight and inversely to the cube of the separation size, but because the limiting size of the coarsest fraction does not fall in the geometric series, a different constant of proportionality must be determined for the 40–60 fraction above. This is easily found by substituting in the derivation of the N formula the integration limits a and $\frac{2a}{3}$, from which the number of particles in this coarsest fraction becomes $N = 0.58\,\frac{V}{a^3}$ instead of $N = 5.70\,\frac{V}{a^3}$ for the other fractions.

Remembering now that we may substitute the percentages of the fractions by weight for V, and using the authors' tabular scheme of calculation on page 432, we have

Number of particles	Diameter, microns	$d.^4 \times$ No.	$d.^3 \times$ No.
$5.73 \times 12.6/10^3$	10	722	72.2
$5.73 \times 16.8/20^3$	20	1925	96.3
$5.73 \times 33.2/40^3$	40	7610	190.2
$3.58 \times 37.4/60^3$	60	8035	133.9
	Sums	18292	492.6

$$\text{Average diameter} = \frac{18292}{492.6} = 37.1 \text{ microns.}$$

This value is in very close agreement with that deduced by the authors, and the writer is therefore of the opinion that the elutriation method is at least capable of giving a satisfactory result.

From the data presented in the paper, the writer is far from convinced that the "amount of time saved by the elimination of the elutriation procedure is enormous." On the contrary the eye-strain and mental effort accompanying the count and estimate of size of many hundreds of particles, the lengthy computations involved, and the many chances for error to creep in, would seem to urge the investigator to find some simpler method. The authors have evidently not appreciated the virtues of the air elutriator, by means of which the complete analysis and exceedingly simple computations involved would require at most two days, one of these being allowed for the 10 micron separation. During these days many other duties might be performed while the elutriator was automatically doing the major portion of the work without attention from the operator.

THE CERAMIC ENGINEERING DEPARTMENT OF THE UNIVERSITY OF WASHINGTON, SEATTLE, WASHINGTON[1]

By Hewitt Wilson

Educational

A four-year curriculum in ceramic engineering has been developed and tried out at the University of Washington, Seattle, Wash. It is based on the ceramic instruction given at the Ohio State University and the University of Illinois, but with more training in the geology and working of clay deposits. During the development period of this complete program, elective courses in cements, limes, and plasters, refractories, and general ceramics have proven popular with the civil, metallurgical, and chemical students.

The Ceramic Laboratory

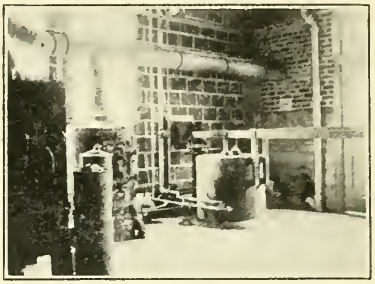
A ceramic laboratory occupying 7,350 sq. ft. total floor space has been built and equipped with the best types of ceramic machinery. It is the only public ceramic laboratory on the Pacific Coast and compares very favorably with the best in the eastern parts of the United States. The ceramic department is housed in the New Mines Laboratory (1921) which is the first building erected in the New Mines group and is the latest representative of the collegiate Gothic style of architecture adopted by the University. The structure is four stories in height, with steel frame, reinforced concrete walls and floors, brick face, terra cotta trim, and slate roof with copper trimmings. A special feature of the building is the unusually large window area. An electric elevator serves all floors; hot and cold water, steam, compressed air, gas, and electricity for lighting, power, and electrolytic purposes, reach all the laboratories.

The ceramic laboratories, together with the offices and classrooms, occupy the northern two-fifths of the building, including the main entrance hall. Apparatus for both manufacturing and testing ceramic products has been provided. The heavy brick

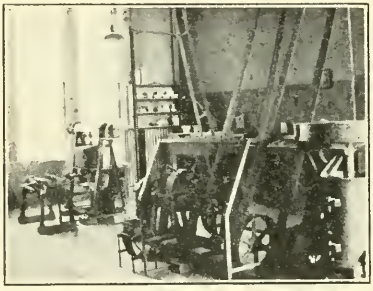
[1] See Wilson, *Jour. Amer. Ceram. Soc.*, **6** [1] 110–14 (1923).

machinery, located on the first or ground floor, consists of a 4-foot Crossley dry and wet pan, a Mueller universal auger machine large enough for side-cut brick and tile with a cutting table, and a large American dry press. The pottery machinery includes a Pat-

Corner in Ceramic Physical Chemical Laboratory.

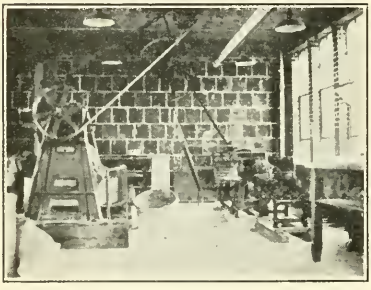


High temperature load test kiln.

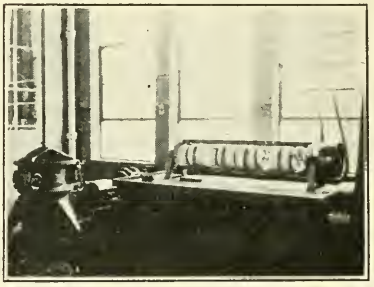


Pottery and brick machinery.

Spraying and grinding machinery.



Heavy clay products machinery. .



Grinding equipment..

terson clay-washing outfit with a double blunger, power screen, agitator, pump and filter press operated with compressed air; a potter's pug mill; jolly wheel and plaster molds for both jollying and casting ware. The terra cotta equipment consists of pressing molds, a De Vilbiss spraying apparatus, engobe and glaze materials and glaze-grinding ball

Table I

Ceramic Engineering Curriculum

First Year

Autumn Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
Mathematics 51	4	Mathematics 52	4	Mathematics 53	4
Civil Engineering 1	3	Civil Engineering 2	3	Civil Engineering 13	3
Civil Engineering 11	3	Civil Engineering 12	3	Civil Engineering 21	3
Chemistry 1 or 21	5	Chemistry 2 or 22	5	Chemistry 3 or 23	5
Mil. Sci. or Phys. Ed.	1⅔	Mil. Sci. or Phys. Ed.	1⅔	Mil. Sci. or Phys. Ed.	1⅔

Second Year

Mathematics 61	3	Mathematics 62	3	Ceramics 90	3
Physics 97	5	Physics 98	5	Physics 99	5
Geology 1	5	Geology 21	5	Geology 120	3
Mining 51	3	Civil Engineering 27	3	Chemistry 111	5
Mil. Sci. or Phys. Ed.	1⅔	Mil. Sci. or Phys. Ed.	1⅔	Mil. Sci. or Phys. Ed.	1⅔

Third Year

Civil Engineering 131	3	Civil Engineering 132	3	English 4	3
Mining 101	3	Metallurgy 153	3	Metallurgy 102	5
Chemistry 181	3	Chemistry 182	3	Ceramics 102	3
Ceramics 100	3	Ceramics 101	3	Ceramics 110	2
Ceramics 104	3	Ceramics 105	3	Mining 106	2
Mining Practice in Summer Vacations.[1]					
Ceramics 121	5				
Ceramics 131	3				
Electives	7				

Fourth Year

		Ceramics 122	5	Ceramics 123	5
		Ceramics 132	3	Ceramics 133	2
		Mining 103	1	Electives	8
		Electives	6		

[1] Practice in mining, metallurgy, geology, or ceramics, accompanied by a report on the work performed is required of all students during a summer vacation following the sophomore or junior year.

mills. The firing apparatus, installed on the first floor includes an oxygen-acetylene cone fusion furnace; a 3-foot, high-temperature, down-draft load-test kiln for two brick; two portable muffle pottery kilns; a 7 by 10-foot open-fired, down-draft brick kiln; and a future 8- by 10-foot terra cotta and glaze kiln of the muffle type. The kilns are equipped with Brown pyrometers and fired with both gas and oil. The underground flues lead to a stack which rises to the full height of the building. General testing apparatus consists of sample molds, a small Mueller auger machine, a sample dry press, aging cellar, three types of volumeters, steam dryer, a constant temperature electric dryer, and transverse and tensile strength machines. The ceramic museum, library, and office, physical-chemical laboratory, and locker room are on the third floor. Lecture, pottery class and storage rooms occupy the fourth floor. Besides the $52,000 ceramic portion of the $130,000 building, over $6,000 has been spent for the purchase and installation of machinery.

Coöperation with the other departments of the University and Bureau of Mines increases the facilities for ceramic work. As one of the chief problems in the Pacific Northwest is the locating and testing of raw materials, the geology department of the College of Science is often called on for advice. For the mining and winning of the raw materials, the experts of the mining department are available. The analytical department of the Bureau of Mines coöperates in the analysis of clay and materials; and the special equipment of the forest products laboratory and the chemical, civil, mechanical, electrical, and highway departments may be used when necessary. The electrometallurgy laboratory is equipped with transformers, voltage regulators, and switchboard, through which power can be used at rates ranging up to 3600 amperes and at voltages varying from 1 to 484. Advantage has been taken of the electrical equipment in a special study of super-refractories, in which clays, sillimanite, and magnesia mixtures have been fused.

Courses in Ceramics

90. Ceramic Materials.—Origin, occurrence, physical properties and preparation of clays, feldspar, limestone, magnesite, silica, and other materials used in the ceramic industry. Prerequisite, sophomore engineering or mining standing. Three lectures and recitations. Three credits; spring.

100. Ceramic Products.—Principles governing the shaping of structural, refractory and fine ceramic wares. Prerequisite, Ceramics 90. Three lectures. Three credits; autumn.

101. Drying and Burning.—The principles of drying and burning; the operation and control of commercial dryers and kilns. Prerequisite, Ceramics 100. Three lectures and recitations. Three credits; winter.

102. Ceramic Decoration.—The preparation and characteristics of vapor, natural clay slip, raw lead, bristol, terra cotta, porcelain and fritted glazes, bright and matt, with methods of coloring. Prerequisite, Ceramics 101. Three lectures and recitations. Three credits; spring.

104, 105. Ceramic Calculations.—The chemistry and physics of preparing, drying and firing ceramic materials. Problems involved in standard methods of testing clays. The blending of raw materials for ceramic bodies and glazes. Prerequisite, Ceramics 90. Three recitations. Three credits; autumn and winter.

110. Ceramic Physical-Chemical Measurements.—Laboratory testing of clays and other ceramic materials. Determination of fineness of grain, shrinkage, porosity and specific gravity; the study of plasticity, bonding power, vitrification and fusion, chemical purification and action of colloids. Prerequisite, Ceramics 105. Laboratory deposit, $10 per quarter. Two laboratory periods. Two credits; spring.

121, 122, 123. Ceramic Products Laboratory.—Laboratory production of structural wares, stoneware, yellow ware, porcelain and refractories. Practice in blending of ceramic materials, molding, drying, firing and glazing ceramic products. Prerequisite, Ceramics 101. Laboratory deposit, $12 per quarter. Three laboratory periods and two recitations. Five credits per quarter; autumn, winter, and spring.

125, 126, 127. Ceramic Plant Design.—Design of ceramic plants. Arrangement of machinery and construction of storage bins, dryers and kilns. Prerequisite, Ceramics 101. Two laboratory periods and one recitation. Three credits; autumn, winter, and spring.

131, 132, 133. Ceramic Thesis.—An original investigation, bearing principally on the ceramic problems of the Pacific Northwest. Laboratory deposit, $5 to $10 per quarter. Laboratory and conference. Three credits, autumn and winter; two credits, spring.

140. Pottery.—Occurrence, winning and preparation of materials used in pottery manufacture. Processes used in molding, drying, firing, glazing, and decorating of pottery. Two lectures and recitations. Two credits; autumn.

150. Lime, Plasters and Cements.—The raw materials, manufacture and testing of lime, calcined gypsum, sand-lime brick, and Portland cement. Prerequisite, Chem. 3. Three lectures and recitations. Three credits; winter.

160. Glass Technology.—Theory and factory practice of glass manufacture. Prerequisite, Ceramics 105. Two lectures and recitations. Two credits; autumn.

170. Metal Enamels.—Theory and practice of metal enameling. Prerequisite, Ceramics 105. Two lectures and recitations. Two credits; autumn.

180. Refractories.—Origin, occurrence and physical properties of fire clays and other refractory materials. The manufacturing problems of fire clay, silica, magnesia, chromite brick, electric furnace products and special refractories. Prerequisite, junior standing. Two recitations and one laboratory period. Laboratory deposit, $5. Three credits per quarter; autumn, winter or spring.

191, 192, 193. General Ceramics.—Occurrence, winning and preparation of materials used in ceramics. Processes used in preparation of raw materials, shaping, drying and firing of ceramic products. One recitation and two laboratory periods. Laboratory deposit, $10. Three credits; autumn, winter and spring.

221, 222, 223. Ceramic Resources.—A study of the ceramic resources of Washington and the Pacific Northwest, or of some particular area in this region. Prerequisite, graduate standing. Hours and credits to be arranged.

231, 232, 233. Ceramics Manufacture.—Studies in the manufacture of clay products, especially the utilization of raw materials found in the Pacific Northwest. Prerequisite, graduate standing. Hours and credits to be arranged.

Univ. of Washington
Seattle, Wash.

PRESIDENT'S PAGE

AIMS OF THE AMERICAN CERAMIC SOCIETY

In this, my first appearance on the President's page, I wish to call the attention of the members to some of the more important things which the officers wish to accomplish during the year.

Of first importance is the fact that the Budget Committee laid out a financial program which calls for approximately $9,000 above the 1922 income. It was found necessary to do this if the work of the SOCIETY was to go forward. This additional $9,000 must come from two sources: advertising in the *Journal*, and new members. It, therefore, becomes the duty of every member interested in this SOCIETY to add to the *Journal* advertisements and it is further important that the membership encourage advertising in the *Journal* by patronizing, whenever possible, the advertisers and neglecting in no instance to call the attention of our advertisers to the fact that their advertisements are being read.

There are undoubtedly hundreds of men interested in some branch of our industry, especially among the consumers, who would willingly join the SOCIETY, either as a Corporation member or Associate member, if the matter was called to their attention. Will not each member of the SOCIETY constitute himself a member of the Membership Committee and "leave no stone unturned" to interest new men in joining us?

It is the hope of the officers that new life will be injected into the Sections which already exist and that a number of new Sections will be formed during the year. Preliminary moves to form new Sections have already been made in Detroit, East Liverpool, Baltimore-Washington and Los Angeles. It is hoped that members living in these districts will give their whole hearted support to the men who are making the initial moves.

In order that the SOCIETY may function as a promoter of ceramic research it is extremely desirable that the Research Committees of the various Divisions make up a list of the important research problems in their particular branch of the industry. Heads of the Ceramic Schools and the Directors of the Bureaus, as well as the heads of the various Departments of Engineering in Universities all over the country will welcome suggestions and much good and valuable work can be gotten under way in this manner.

ACTIVITIES OF THE SOCIETY

ALL OUT FOR THE BARNYARD GOLF SQUAD!

Professional sporting writers no doubt turn their thumbs down and their noses up at intramural sports, but this only sends our opinion of them lower and of ourselves higher, for we have had more fun this month watching our members pitch horseshoes and shoot—marbles. Every day at ten-thirty and at two-thirty the lists were thrown open with a paper-knife and all entries noted. The University of Illinois Ceramic department sent a gallant team, to wit, Hursh and Parmelee. These two for a while tied for first place in the horseshoe parallelogram, but Hursh dropped ballast by cashing some of the AMERICAN CERAMIC SOCIETY bonds and was able to make another ringer, thus putting himself ahead. Sam Wilkinson of Trenton went west for early spring practice and brought back a record flight of the lucky omens.

What we like to see best is the staid officials of weighty corporations, and the important carriers of government-owned brief cases, throwing off their coats and cares to enter into the sport. Look at the list—W. B. Kerr, C. F. Tefft, L. I. Shaw, A. S. Watts, Karl Türk, to mention only a few.

Like lambs in the springtime, the younger members gamboled on the green (roll along, mah beauties), and did their share of increasing the general joy.

To come down to brass tacks, U. S. currency, there were twenty-five persons who advertised the SOCIETY, eight more than last month, with a consequent increase of eight in the number of converts. The needed average of personal memberships, 7.31 a week, has been more than reached. That the needed average of corporation memberships was not reached, means that we must concentrate. Seat yourself firmly before your desk, press the thumbs and forefingers together, close the eyes and *think* of a prospective Corporation Member. Seize the telephone or your hat, and call up or on said prospect. Mail the resulting card to the Secretary of the SOCIETY and receive your due in the June number of the *Journal*. Go at least one better than these:

	Personal	Corporation
R. K. Hursh	3	
C. W. Parmelee	2	
Samuel Wilkinson	2	
Charles A. Smith	1	
Lawrence H. Brown	1	
C. E. Fulton	1	
Paul K. Klaesius	1	
Hobart M. Kraner	1	
A. L. Duhart	1	
L. I. Shaw	1	
Horace H. Clark	1	
Leon J. Frost	1	
Chas. H. Modes	1	
Robert F. Ferguson	1	
W. B. Kerr	1	
A. Malinovszky	1	
W. E. Buck	1	
A. S. Watts	1	
C. Forrest Tefft	1	
Ruth E. Canfield	1	
Alice A. Ayars	1	

	Personal	Corporation
J. M. Manor	1	
Karl Türk	1	
Alexander Silverman	1	
Wilbur F. Brown	1	
Office	8	3
Total	37	3

Status of Membership

March 14, 1923	1710	223
Resigned	9	0
	1701	223
New Members	37	3
April 14, 1923	1738	226

NEW MEMBERS FROM MARCH 14, 1923, TO APRIL 14, 1923

ASSOCIATE

Ammon, Millard G., 53 Euclid Ave., Columbus, Ohio, Student, O. S. U.

Armstrong, Robert Hood, Watsontown, Pa., Ceramic Engineer, Fiske & Co., Inc., Watsontown, Pa.

Ayars, Alice A., 1914 West Boulevard, Cleveland, Ohio. Glazing and Firing Pottery for Cleveland High School.

Bradley, Richard S., 105 Daniel St., Champaign, Ill., Student, Univ. of Ill.

Briggs, Wm. B., 281 Margueritta St., Toronto, Ont., Can., Supt. Enameling and Mixing Dept., Standard Sanitary Mfg. Co., Toronto, Ont., Can.

Carter, John D., 121 S. 3d St., Philadelphia, Pa., Philadelphia Quartz Co.

Clark, H. E., Room 409 Whitney Bldg., 310 Main St., Springfield, Mass., Treas. & Gen. Mgr., The Springfield Brick Co.

Deeds, Floyd D., Grant St., Newell, W. Va., Ceramic Asst., E. M. Knowles China Co.

Douglas, Freeman S., Box 108, East Liverpool, Ohio., Asst. Engr., The Babcock & Wilcox Co.

Eccles, J. H., 371 Aqueduct St., Montreal, Can., Canada Firebrick Co., Ltd.

Ely, William Grosvenor, Jr., Y. M. C. A., Kokomo, Ind., Asst. Supt. Pittsburgh Plate Glass Co.

Fliedner, Helen M., 1971 West 99th St., Cleveland, O., Supervisor of Art.

Giacomini, Clarence D., 770 Osage St., Leavenworth, Kan., Head of Enameling Dept., Great Western Stove Co.

Harrison, Harold C., 791 Oak St., Columbus, Ohio, Student, O. S. U.

Herger, Howard C., % Pierce Glass Co., Port Allegany, Pa., Secy. and Chem.

Jenkins, S. Mark, 420 Bulkley Bldg., Cleveland, Ohio, Dist. Mgr. Cleveland District, Celite Products Co.

Ladoo, Raymond B., 1448 Girard St., N. W., Washington, D. C., Mineral Technologist, Bur. of Mines, Washington, D. C.

Leibowitz, Samuel, Haines and Russel St., Baltimore, Md., Mgr. Maryland Chemical Co.

Manley, Rowland, 3820 Cornelia Ave., Chicago, Ill., Ceramic Engr., Peoples Gas Light and Coke Co.

Matlack, W. Fred, Golding Sons Co., Trenton, N. J., Mgr. Trenton & Wilmington Depts.

Meadows, A., 5509 Brooklyn Ave., Detroit, Mich., Chief Engr., The Detroit Vapor Stove Co.

Mountford, Enoch, 315 Ardmore Ave., Trenton, N. J., Gen. Mgr., Anchor Pottery, Trenton, N. J.

Owen, C. E., Box 108, East Liverpool, Ohio, Ceramist, The Babcock and Wilcox Co.

Platts, Matthew, Box 52, Millrae, California, Factory Mgr., West Coast Porcelain Mfrs.

Pfeiffer, Wilbur H., 814 West Main St., Urbana, Ill., Student, Univ. of Ill.

Pole, Gordon R., Mellon Institute, Pittsburgh, Pa., Asst. Fellow.

Reif, Richard E., 706 Gregory Place, Urbana, Ill., Student, Univ. of Ill.

Seasholtz, Ralph Edgar, 1236 Hill Road, Reading, Pa., Foreman with J. M. Seasholtz, Inc.

Schofield, Perlee W., Chicago Heights, Ill., Pres. & Gen. Mgr., Chicago Heights Bottle Co.

Skinner, Sherrod E., 699 Stanley St., New Britain, Conn., Mechanical Engr., Landers Frary & Clark.

Smith, Albert J., 111 Richardson St., Syracuse, N. Y., Supt. Iroquois China Co.

Tracy, Ray C., % Washington Iron Works, Los Angeles, Calif., Foreman, Enameling Dept.

Vaughn, Haydn E., 7107 Mt. Vernon St., Pittsburgh, Pa., Student, Univ. of Pitts.

Walworth, Chester Alexander, % Libbey-Owens Sheet Glass Co., Charleston, W. Va., Chemist.

White, Francis Guy, University Club, St. Louis, Mo.

Yang, S. D., Box 46, University Station, Urbana, Ill., Student, Univ. of Ill.

Wu, Tso Ming, 160 W. 9th Ave., Columbus, Ohio, Student, O. S. U.

CORPORATIONS

American Blower Company, 6004 Russell St., Detroit, Mich., Thomas Chester.

Karr Range Co., Belleville, Ill., T. A. Stoelzle, Gen. Mgr.

The River & Feldspar Company, P. O. Box 581, Middletown, Conn., A. C. Postley, Secy. & Treas.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Samuel P. Adams is living at 316 South Grove Street, Oak Park, Ill.

Russell E. Arnold who has been at Derry, Pa. has been transferred to the Research Building, Westinghouse Elec. and Mfg. Co., at East Pittsburgh, Pa.

Bertram L. Cassady has moved from Chippewa Lake, Ohio to Tulsa, Okla.

Arthur L. Donnenwirth who has been with the Jeffery-Dewitt Insulator Co., at Kenova, W. Va., is now with the Westinghouse High Voltage Insulator Co., at Derry, Pa.

Karl L. Ford has changed his address to 3156 18th Street, N. W., Washington, D. C.

Harry D. Foster, also of the Bureau of Standards in Washington, has moved to 4310 4th Street, N. W., Washington, D. C.

R. B. Gilmore until recently located at the Ceramic Experiment Station, U. S. Bureau of Mines, Columbus, has accepted a position with the Laclede-Christy Clay Products Company, St Louis, Mo.

Arthur F. Gorton, formerly with the National Malleable Castings Co., at Cleveland has accepted a position with the Western Electric Company, Hawthorne Station, Chicago, Ill.

C. A. Hahn has left the Parker Russell Mfg. Co. and is now with the Missouri Fire Brick Co., Security Bldg., St. Louis, Mo.

Marsden H. Hunt is now with the Western Electric Company, First National Bank Building, San Francisco, Cal.

Robert W. Jones, geologist at Catskill, N. Y., is living at 15 New St.

Hobart M. Kraner who was formerly with the Ceramic Experiment Station, U. S. Bureau of Mines, Columbus, is now with the A. C. Spark Plug Co., at Flint, Mich.

J. L. Laird has affiliated himself with the Research Department of the Ford Motor Co., and is living at 25 Francis Street, Dearborn, Mich.

T. Poole Maynard is located at 1526 Hurt Bldg., Atlanta, Ga.

J. C. Montgomery, recently of the Limoges China Co., Sebring, Ohio is with the Atlas China Co., at Niles, Ohio.

C. P. Nye is now with the Conemaugh Iron Works, Blairsville, Pa. Mr. Nye was formerly manager of the Richmond Radiator Company of Uniontown, Pa.

Harold H. Preston lives at 415 Dithridge Street, Pittsburgh, Pa.

John Rhead is with the Sanitary Earthenware Specialty Co., of Columbus, Ohio.

Fred H. Robertson writes that he has moved from Los Angeles, Cal., to 204 West Tomita Street, Glendale, Cal.

Oscar Scherer is now at 212 4th Ave., North Nashville, Tenn.

T. A. Shegog has removed recently from New York City to 345 Indiana Ave., W., Sebring, Ohio.

Charles L. Stamm is living at 29 South 12th Street, Mt. Vernon, N. Y.

Jack Holmes Waggoner, late of the Canadian Libbey Owens Sheet Glass Co., Ltd., has moved to Topeka, Kans., Route 27.

C. P. Wood has been transferred from the Philadelphia office of Lockwood, Greene and Co., to 101 Park Ave., New York City.

Y. Y. Wong of the Chen Kwong Co., is now at 237 Des Voeux Road, Hong Kong, China.

NO ADDRESSES

Information regarding the addresses of any of the following members will be received with thanks by the Secretary's office. A few of the names published in the December issue of the *Bulletin* have been located.

G. V. Baker, Penn Feldspar Co., Barnard, N. Y.

Earl A. Bickel, Postville Clay Products Co., Postville, Iowa.

J. P. Callaghan, Teaque Hotel, Montgomery, Ala.

C. V. Cameron, Whiting-Mead Commercial Co., 2035 E. Vernon Ave., Los Angeles, Cal.

Homer T. Darlington, Box 736, Natrona, Pa.

Charles S. Dolley, Keramoid Mfg. Co., Fort Madison, Iowa.

Koji Fujioka, Shofu Porcelain Mfg. Co., Kyoto, Japan.

John L. Greenwood, Lehigh Sewer Pipe and Tile Co., Lehigh, Iowa.

S. B. Henshaw, Libbey-Owens Sheet Glass Co., Charleston, W. Va.

Sidney H. Ivery, 4432 Gibson Ave., St. Louis, Mo.

William J. Johnson, 4148 Langland St., Cincinnati, Ohio.

Y. Kitamura, Shofu Kogo Kafushiki Kaisha, Kyoto, Japan.

J. M. Knote, Mines Dept., L. S. Corporation, Sault Ste. Marie, Ont., Canada.

Leon W. Mitchell, Rock Island, Ill.

Knud Y. Chr. Moller, 4956 McPherson Ave., St. Louis, Mo.

K. Okura, 84 Kobayashi-Cho, Nagoya, Japan.

W. Pendrup, Coonley Mfg. Co., Cicero, Ill.
H. M. Pulsifer, Manhattan Bldg., Chicago, Illinois.
Nugent A. Ragland, 1280 West Adams St., Los Angeles, Cal.
Tefft, T. Dwight.
J. E. Thompson, 2507 Townsend Ave., Detroit, Mich.
A. L. Van Moore, American Photo. Glass and Export Co., New Eagle, Pa.
William J. Vodick, 1733 Lake Ave., Wilmette, Ill.

OFFICIAL PERSONNEL OF THE ENAMEL DIVISION

Officers

H. F. Staley, *Chairman*
Metal and Thermit Corp.
120 Broadway, New York City
R. R. Danielson, Secretary
Beaver Enameling Co.
Ellwood City, Pa.

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Coonley Mfg. Co.
Cicero, Ill.
W. C. Lindemann
A. J. Lindemann & Hoverson Co.
Milwaukee, Wis.
M. E. Manson
Rundle Mfg. Co.
Milwaukee, Wis.
D. F. Riess
The Vollrath Co.
Sheboygan, Wis

Standing Committees

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Mansfield, Ohio
Aupperle, J. A.
American Rolling Mill Co.
Middletown, Ohio
Bardush, J. F.
Grand Rapids Refrigerator Co.
Grand Rapids, Mich
Blackburn, C. A.
Cleveland Metal Products Co.
Cleveland, Ohio
Buck, D. M.
American Sheet & Tin Plate Co.
Pittsburgh, Pa.
Dimmick, R. B.
United Alloy Steel Corp.
Canton, Ohio
Richardson, Ernest
Ingram-Richardson Co.
Beaver Falls, Pa.

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Jackson, W. L.
Wolff Mfg. Co.
111 S. Kilpatrick Ave.
Chicago, Ill.
Kahn, B. B.
Estate Stove Co.
Hamilton, Ohio
Manson, M. E.
Rundle Mfg. Co.
Milwaukee, Wis.
Reed, J. C.
Standard Sanitary Mfg. Co.
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Rice, B. A.
Elyria Enameled Products Co.
Elyria, Ohio

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A. D. Little, Inc.
4020 McRee Ave.
St. Louis, Mo.
Cooke, R. D.
Columbian Stamping & Enameling Co.
Terre Haute, Ind.
Frost, L. J.
Vitreous Enameling Co.
Box 67, Station D
Cleveland, Ohio
Geisinger, E. E.
The Pfaudler Co.
Rochester, N. Y.
Gifford, M. C.
Chicago Hardware Foundry Co.
Chicago, Ill.
Manson, M. E.
Rundle Mfg. Co.
Milwaukee, Wis.
Storey, O. W.
C. F. Burgess Laboratories
Madison, Wis.

Data

T. D. Hartshorn, *Chairman*
U. S. Bureau of Standards
Kensington, Md.
Arnold, H. C.
A. D. Little, Inc.
4020 McRee Ave.
St. Louis, Mo.
Hausen, J. E.
Mellon Institute
Pittsburgh, Pa

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Sheboygan, Wis.
Blackburn, C. A.
Cleveland Metal Products Co.
Cleveland, Ohio
Cox, H. N.
Central Stamping Co.
48 Woodland Ave.
Glen Ridge, N. J.
DeWitt, Bert G.
Belmont Stamping Co.
New Philadelphia, Ohio
Keehn, C. C.
Lisk Mfg. Co.
Canandaigua, N. Y.

Sweely, B. T.
Baltimore Enamel & Novelty Co.
Box 34
Baltimore, Md.

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Karl Türk, *Chairman*
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Baltimore, Md.
Dwyer, Emmet
Michigan Stove Co.
Detroit, Mich.
Hansen, J. E.
Mellon Institute
Pittsburgh, Pa.
Hodek, F. E.
General Porcelain Enameling Co.
Chicago, Ill.
Jaeger, F. G.
Superior Enameled Products Co.
10th & Mullanphy Sts.
St. Louis, Mo.
Landrum, R. D.
Vitreous Enameling Co.
Grant Ave.
Cleveland, Ohio
Roadhouse, Robert
Benjamin Electric Co.
Des Plaines, Ill.
Smoot, C. E.
American Enameling & Stamping Co.
1900 Santa Fé Ave.
Los Angeles, Cal.

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Enameling Furnaces for Sheet Metal Wares

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Baltimore, Md.
Agge, Franklin
Republic Metalware Co.
Buffalo, N. Y.
Bittner, A. G.
National Enameling & Stamping Co.
Box 1400, Central Sta.
St. Louis, Mo.
Blackburn, C. A.
Cleveland Metal Products Co.
Cleveland, Ohio
Clarke, A. E.
Benjamin Electric Co.
Des Plaines, Ill.
Cox, H. N.
48 Woodland Ave.
Glen Ridge, N. J.
De Witt, Bert G.
Belmont Stamping Co.
New Philadelphia, Ohio
Geuder, George
38 15th Ave.
Milwaukee, Wis.
Hogenson, Wm.
Chicago Vitreous Enameling Co.
1421 S. 55th St.
Cicero, Ill.
Sanders, J. W.
U. S. Stamping Co.
Moundsville, West Virginia
Swift, Geo. C.
Enamel Products Co.
2029 E. 115th St.
Cleveland, Ohio
Taylor, Royal
Canton Stamping & Enameling Co.
707 12th St. N. W.
Canton, Ohio
Türk, Karl
116 W. Hamilton Ave.
Baltimore, Md.
Vollrath, J. C.
The Vollrath Co.
Sheboygan, Wis.

Enameling Furnaces for Sanitary Wares

Mahoney, Frank B., *Chairman*
Crane Enamel Ware Co.
Chattanooga, Tenn.
Arrott, A. J.
U. S. Sanitary Mfg. Co.
Pittsburgh, Pa.
Bowman, W. J.
Trenton Fire Clay & Porcelain Co.
Trenton, N. J.
Barnes, T. R.
Barnes Mfg. Co.
Mansfield, Ohio
Ebinger, Jr., D. H.
Ebinger Sanitary Mfg. Co.
735 Linwood Ave.
Columbus, Ohio
Kelley, J. A.
Iron City Sanitary Mfg. Co.
1514 Oliver Bldg.
Pittsburgh, Pa.
Kohler, W. J.
Kohler Co.
Kohler, Wis.
Ludlum, B. A.
Union Sanitary Works
Noblesville, Ind.
Manson, M. E.
Rundle Mfg. Co.
Milwaukee, Wis.
Nye, C. P.
Conemaugh Iron Works
Blairsville, Pa.
Tafel, Theodore, Jr.
Standard Sanitary Mfg. Co.
551 Preble Ave., N. S.
Pittsburgh, Pa.
Wassman, L. G.
Wolff Mfg. Co.
3320 Diversy Ave.
Chicago, Ill.

Enameling Furnaces for Wet Enamel for Cast Iron

Lindemann, W. C., *Chairman*
A. J. Lindemann & Hoverson Co.
Milwaukee, Wis.
Adams, L. A.
Mansfield Vitreous Enameling Co.
Mansfield, Ohio
Bridge, L. D.
Bridge & Beach Mfg. Co.
St. Louis, Mo.
Coulston, E. V.
Rock Island Stove Co.
Rock Island, Illinois
Cushman, H. D.
819 Finance Bldg.
Cleveland, Ohio
Luepke, Emil
Quick Meal Stove Co.
St. Louis, Mo.
Munroe, L. J.
912 Colborne St.
London, Ont., Canada
Roberts, F. G.
Porcelain Enamel & Mfg. Co.
Baltimore, Md.
Walton, W. E.
American Stove Co.
St. Louis, Mo.
Wells, R. D.
Floyd-Wells Co.
Royersford, Pa.

Smelting Furnaces and Smelter Linings

Manson, M. E., *Chairman*
Rundle Mfg. Co.
Milwaukee, Wis.
Bittner, A. G.
National Enameling & Stamping Co.
Central Sta., Box 1400
St. Louis, Mo

Davis, H. E.
Northwestern Terra Cotta Co
Chicago, Ill.
Tafel, Theodore Jr.
Standard Sanitary Mfg. Co.
551 Preble Ave., N. S.
Pittsburgh, Pa.
Wassman, L. G.
Wolff Mfg. Co.
3320 Diversy Ave.
Chicago, Ill.
Williams, W. G.
Coonley Mfg. Co.
Cicero, Ill.

DRY GRINDING MILLS AND LININGS

Tafel, Theodore, Jr., *Chairman*
Standard Sanitary Mfg. Co.
Pittsburgh, Pa.

Kohler, W. J.
Kohler Co.
Kohler, Wis.
Ludlum, B. A.
Union Sanitary Works
Noblesville, Ind.
Mahoney, F. B.
Crane Enamel Ware Co.
Chattanooga, Tenn.
Nye, C. P.
Conemaugh Iron Works
Blairsville, Pa.
Wassman, L. G.
Wolff Mfg. Co.
3320 Diversy Ave.
Chicago, Ill.

DR. NAVIAS RECEIVES APPOINTMENT

Dr. Louis Navias has been appointed special expert in ceramics and optical glass by the United States Tariff Commission, the work to be carried on under the direction of Dr. Karl Langenbeck. Dr. Navias received his degree of doctor of philosophy in ceramics in January from the University of Illinois. His graduate work was completed under the direction of Dr. E. W. Washburn.

OBITUARIES

News of the death of Dr. C. W. Waggoner, head of the department of physics at the University of West Virginia, Morgantown, W. Va., has been received in the Secretary's office. Dr. Waggoner was thrown from his horse, sustaining a fractured skull. At the time of his death, October, 1922, he was on a year's leave of absence from the University doing research work in connection with the United States Plate Glass Company at Shreveport, La.

Chauncey William Waggoner was born in Rock Bride, Ohio in 1881. He received the degree of M.S.E.E. from Ohio University in 1904, A.M. degree from Cornell in 1905 and Ph.D. from Cornell in 1909. Since 1909 Dr. Waggoner had been professor of Physics at the University of West Virginia. Through his notable work on light, magnetism and the manufacture of glass he became well known in scientific circles and his writings have appeared frequently in scientific journals of the country. He was assistant commissioner of weights and measures of West Virginia, consulting engineer for a number of glass manufacturing plants and among scientific societies he was a member of Sigma Xi, the AMERICAN CERAMIC SOCIETY and the American Association for the Advancement of Science.

His death is greatly to be regretted and he will be missed from his place as a man of science as well as a useful citizen.

Nathaniel Wright Lord, Jr.

Nathaniel Wright Lord, Jr. died on April 8, 1923 at Mt. Carmel Hospital, Columbus, Ohio, after an illness of three months' duration. Mr. Lord, who was twenty-three years of age was a third-year student in the department of Ceramic Engineering at Ohio State University. During the years 1920 and 1921 he was employed by the American Encaustic Tiling Company at Zanesville, Ohio. In 1918 Mr. Lord was a member of the Student Army Training Corps at Ohio State University. He is survived by his mother, Mrs. N. W Lord of Columbus, Ohio and two brothers, James O. Lord, instructor in metallurgy, and Leland L. Lord, a first year student in the College of Arts,

both at O. S. U. He was a son of the late Prof. N. W. Lord of Ohio State University. For the past two years, Mr. Lord had been an associate member of the AMERICAN CERAMIC SOCIETY.

NOTES AND NEWS

RESEARCH ORGANIZATION OF THE NATIONAL LIME ASSOCIATION

BY M. E. HOLMES

Within recent years the uses of lime in chemistry, construction and agriculture have taken on such an increasingly technical aspect that the lime industry today is one of our highly technical industries especially in regard to chemical engineering. The use of lime in agriculture involves a detailed application of the principles of agronomy and chemistry. The use of lime in construction has ceased to be the rule of thumb proposition that it was in the past and demands are now being made for scientifically produced lime products and technically controlled building operations. The use of lime for chemical purposes which has grown with remarkable rapidity during recent years has made new demands upon the lime industry for technical information regarding the fundamental properties and utility of lime and the many details of its adaptability to the varied and numerous chemical functions in modern manufacturing and sanitary engineering processes.

The lime industry has met these demands by establishing a research organization with headquarters at 918 G Street, N. W., Washington, D. C. The lime industry recognizes that all the lime producing companies have a common interest in furthering and developing the knowledge of lime and its uses and also recognizes that this work can best be done by a common central research organization instead of each company attempting to do it individually in which case there would be inadequate facilities and wasteful duplication.

MAJOR E. HOLMES, PH.D., Chemical Director, National Lime Association.

The research organization of the National Lime Association consists of a central laboratory in Washington, and fellowships at Universities and government laboratories under the direction of Dr. M. E. Holmes, Chemical Director. In addition, coöperative research relations are maintained with the laboratories of industrial plants, universities and other research agencies.

The central laboratory at Washington is concentrating on the fundamental properties of commercial limes. Samples of limes from nearly every lime plant in the country are being studied with the object of getting as complete information as possible on all their fundamental properties, such as density, porosity, characteristics in suspensions, chemical reactivity toward solids, solutions and gases, etc. These data have a bearing upon practically every industrial use of lime.

Other problems under way in the central laboratory are the development of new uses for lime, a study of improvements in the quick-setting properties of lime mortar, the

preparation of ready mixed plaster, the study of lime as a causticizing agent, the development of improved aqueous lime paints and the solving of problems encountered by the users of lime.

The Association maintains a fellowship at Ohio State University where Prof. J. R. Withrow is coöperating in directing an extensive study of the burning of various typical limestones under various conditions of time and temperature to determine the effect of these conditions upon the properties of the lime for construction and chemical purposes.

The Association maintains a fellowship at Indiana University where Prof. F. C. Mathers is coöperating in directing research on the effect of admixtures upon the hardening properties of lime mortar, the manufacture of special lime products, such as peroxides, the study of lime as a dehydrating agent, polishing agent, etc.

The Association also maintains a fellowship at the Bureau of Standards at Washington, D. C., where Mr. Warren E. Emley is coöperating in the direction of work designed to improve the uses of lime primarily for construction purposes. This work is primarily along the line of improved lime products and improving the use of lime products. Unlike the other research activities of the Association the work at the Bureau of Standards under the direction of Mr. Emley has been in progress a number of years and the valuable results that have been achieved are well known. The agricultural department of the Association also maintains a fellowship at the University of Tennessee.

The Association will also establish at least one more university fellowship to work upon problems in the chemical and construction uses of lime but the place has not been decided upon at this writing.

Coöperative research relations are maintained with several universities, especially Cornell and Massachusetts Institute of Technology, which have departments interested in lime research for their post-graduate students, whereby they render valuable service to the lime industry and at the same time the arrangement provides the researcher with a most fertile field of study.

The main idea back of the research organization is service, service to the user of lime whereby the use of lime can be extended and enlarged upon a thoroughly sound and scientific basis. The results of the research will be given the widest possible publicity in the form of magazine articles, and bulletins and will serve as the background for the various activities of the association, such as standardization and field promotion work.

ENGINEERS, SCIENTISTS, AND EDITORS PLAN TO STANDARDIZE SYMBOLS AND ABBREVIATIONS

A recent conference held in New York City under the auspices of the American Engineering Standards Committee revealed a sentiment among engineers, scientists, government officials, business paper editors, and industrial executives, emphatically in favor of the unification of technical and scientific abbreviations and symbols.

It was agreed on all sides that the standardization of abbreviations and symbols would result in inestimable mental economies. The present situation with respect to the use of abbreviations and symbols in engineering, scientific, and other technical fields is comparable to a language which has degenerated into a multiplicity of dialects each of which has to be translated for the users of the others. Abbreviations and symbols constitute an ever growing and important part of the language of engineers, scientists, industrial editors, and other technical men. The use of one symbol or abbreviation for several different terms and the use of several different symbols or abbreviations for one meaning are, however, at present causing a great deal of confusion, misunderstanding, and, often, serious errors.

The conference was called upon requests from the American Institute of Electrical

Engineers, the American Society of Mechanical Engineers, and the Association of Edison Illuminating Companies, to consider abbreviations and symbols, but after some discussion of the subject it was thought desirable to include as a part of the project, the graphical symbols which are used in engineering drawings, diagrams, and the like, for representing instruments and apparatus and components of them.

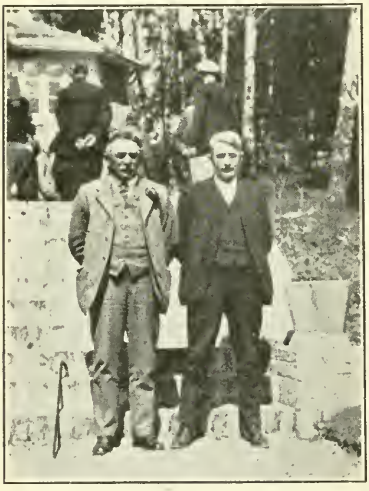
It was agreed that the coöperation of foreign standardizing bodies should be sought, in the development of the work. The importance of international uniformity in symbols is great on account of the international character of much engineering and scientific work, and the importance of reference books and periodicals in foreign languages.

The work will go forward under a committee organization developed in accordance with the rules and procedure of the American Engineering Standards Committee.

THE CERAMIC SOCIETY

By James A. Audley

The volumes of the *Transactions* of the North Staffordshire Ceramic Society, the precursor of the Ceramic Society in England, contain no official record of the foundation of the Society or of its earliest meetings. The first volume relates to proceedings in the session 1901–2, and it was somewhat hastily assumed that this must have corresponded with the first year of the Society's existence. Accordingly, in hurrying to complete and dispatch the brief notice for insertion in the *Journal of the American Ceramic Society*, January, 1923, the Society was stated to have been established in 1901. Some doubt having arisen, the writer determined to make a careful search in contemporary publications of 1900 and 1901, and definitely ascertained that the actual formation of the Society took place in the autumn of 1900. Several meetings were held, but, apart from summarized reports in the press during this time, no authoritative account of the work of the first session was published, the first volume of the *Transactions* issued being concerned with the second session.



Dr. J. W. Mellor (right) and Sir Wm. J. Jones, K.B.E. (left) at Mr. Odelberg's house at Gustafsberg.

It should have been mentioned that Mr. Henry Watkin was the second president succeeding Mr. W. Burton and preceding Mr. B. Moore.

ASSOCIATION OF CENTENARY FIRMS OF THE UNITED STATES

This is an association of firms which are now being managed by direct descendants in the male line from the founders of the concerns one hundred years old. The present roster contains eighty-one concerns.

Mr. Burnet Landreth of the D. Landreth Seed Company, Bristol, Pa., wishes to learn of the ceramic concerns which have been managed continuously for one hundred years by direct male descendants of the founders of the business.

Ten of the concerns on the roster of the Association of Centenary Firms have so

changed the management that none of the direct descendants of the founder remain in the administration of the firms affairs although for one hundred years their management has been directed by direct male descendants.

It is estimated that probably there are not a half dozen concerns in addition to the eighty-one establishments in the United States that are eligible for membership.

A. H. Hews and Co., Cambridge, Mass., and Whitney Glass Works, Glassboro, N. J., are the only centenarians listed from the ceramic industries. Do you know of others?

NOTES FROM THE U. S. BUREAU OF MINES

Oxidation of Ceramic Wares during Firing

A study of the chemical and physical changes taking place in clay bodies during firing is under way at the ceramic experiment station of the Bureau of Mines, Columbus, Ohio, and will be continued during the coming year since a better understanding of the reactions taking place in a ceramic kiln is essential before many of the problems confronting the ceramic industry can be solved.

Much fundamental information of a laboratory character has been obtained as to the oxidation of iron, sulphur, and organic material at all stages in the firing. A paper by Bole and Jackson containing data on the rate of evolution of SO_2–SO_3–H_2O–CO_2 from a fire-clay body at varying temperatures in an atmosphere of oxygen is in course of preparation. This is the first of a series of papers to appear giving results of this work. A study of the effect of varying the bathing atmosphere within kiln limits will now be made. It is proposed later to investigate the problem along similar lines on industrial kilns.

After sufficient fundamental data has been obtained, it is proposed to investigate the several special problems which have arisen in the field in connection with the cooperative work with the four Heavy Clay Products' Associations. These problems include among others (*a*) the possibility of removing sulphur fumes from kiln gases so that they may be run directly through dryers, (*b*) the cause and prevention of red core in buff face brick, (*c*) an explanation of the so-called "blue smoke" and its influence on oxidation, (*d*) the cause and prevention of slabbing or popping of ware from siderite bearing clays.

Dolomite and Magnesite Refractories

Before the best results can be obtained from dolomite as a refractory, certain fundamental data not yet available must be at hand. Since previous work has indicated that highly aluminous fluxes together with a small percentage of the sesqui oxide of iron are the most desirable for the dead burning of dolomite, the problem is being studied systematically at the Ceramic experiment station of the Bureau of Mines.

Phase rule diagrams for three component systems are being worked out in order to find the non-slaking areas using varying percentages of the flux. The system has been completed using 10% flux and it is planned to continue the work using 5–15–20 and 25% flux. The aluminous flux used is a bauxitic clay and the iron oxide may or may not have to be added depending upon the per cent present in the clay.

The material used up to the present has been a dense Niagara dolomite, but a highly crystalline stone such as that obtained near Gouverneur, N. Y. will later be tried out. Using the information obtained from the one diagram already completed, some good bricks have been made but much more is anticipated after the whole field has been covered.

Investigation of the System ZrO_2–TiO_2–SiO_2

The metallurgical field is constantly demanding a refractory material which will stand up under more severe heat conditions, states the Bureau of Mines. There are many other demands on a refractory for specific utilization, but it must be primarily a material with a high softening point. The refractory further must not vary widely in acidity or basicity from the slag with which it comes in contact. With these considerations together with that of economy in view, it is apparent that there are only a very few materials available for the purpose. It is proposed by the Bureau of Mines therefore to start work on the system ZrO_2–Al_2O_3–SiO_2 with the object in view of obtaining fundamental data in regard to refractories, abrasives and quartz glass. The purification of the ZrO_2 has already been completed. An induction furnace in which temperatures up to 3000°C can be attained is being installed for this and similar work at the Ceramic experiment station at Columbus, Ohio.

CLOSER COÖPERATION BETWEEN GOVERNMENT AND INDUSTRY IN STANDARDIZATION WORK

Another important step toward the elimination of differences between specifications for government purchases and specifications for similar materials produced for the general commercial market, was taken at the March meeting of the American Engineering Standards Committee, when it was voted to accede to the suggestion of the Federal Specifications Board that the A.E.S.C. submit to the Board for its information all standards which are being considered by the A.E.S.C. for approval. In cases where standards before the A.E.S.C. prove also of interest to any government department, the matter of their formal approval as government standards may then be considered by the Federal Specifications Board.

The Federal Board has for some time used the machinery of the American Engineering Standards Committee to bring its specifications into harmony with the best commercial practice, thereby broadening its source of supply and lessening the cost of production. Under this arrangement twenty-two specifications for government purchases have already been submitted to industry for criticism in advance of their adoption by the Federal Specifications Board.

Through the presence of seven departments of the federal government in the membership of the American Engineering Standards Committee the government has participated in the formulation of industrial standards. Now industry has an opportunity to participate, as an advisor, in the formulation of government standards, thus minimizing the possibilities of duplicated effort in the field of standardization.

MINUTES OF THE ELECTRICAL PORCELAIN SECTION, ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES

A regular meeting of the Electrical Porcelain Section of the Associated Manufacturers of Electrical Supplies was held at the Wm. Penn Hotel, Pittsburgh, Pa. on Wednesday, December 13th, 1922.

Invitations to attend the meeting were extended to every manufacturer of electrical porcelain, the object being to acquaint the entire industry with the advantages possible through association membership.

ROLL CALL

Brunt Porcelain Co.	Geo. F. Brunt
Cook Pottery Co.	Paul G. Duryea
Federal Porcelain Co.	R. G. Spencer
Hartford Faience Co.	F. L. Bishop
Imperial Porcelain Works	B. B. Dinsmore
Locke Insulator Mfg. Co.	B. A. Plimpton
Westinghouse Hi-Voltage Ins. Co.	Geo. I. Gilchrist
Star Porcelain Co.	F. F. Gardinor
R. Thomas & Sons Co.	J. E. Way
	H. R. Holmes

and by special invitation the following non members:

American Porcelain Co.	W. J. Curry
Colonial Insulator Co.	Jas. R. Hemphill
Carey Ohio Porcelain Co.	W. D. Wooley
Davidson Porcelain Co.	W. Davidson
Findlay Elec. Porcelain Co.	J. V. Patterson
General Porcelain Co.	W. S. Cook
Specialty Porcelain Works	J. W. Boch
Standard Porcelain Co.	Harry Yates
Summit Porcelain Co.	Anthony Comfort
Trumbull Elec. Mfg. Co.	J. M. Gilfillan
Trenle Porcelain Co.	G. A. Trenle
	H. W. Blake
Union Electrical Porcelain Works	J. Mackenzie
West Virginia Porcelain Co.	Dr. Ferrell

The meeting was called to order by the Chairman, Mr. J. E. Way at 10:30 A.M. Mr. Duryea explained briefly the call for the meeting after which the Chairman introduced Mr. S. L. Nicholson, President of the A.M.E.S. Mr. Nicholson who is also Chairman of the Electrical Manufacturers Council, reviewed the history of the Council, and described very clearly the procedure of its various committees in handling matters of vital interest to the Electrical Manufacturing industry. Among those especially mentioned was regulatory legislation and ordinances proposed by State and Municipal authorities affecting the electrical industry, and it was convincingly shown that when such proposals threaten the rights of Manufacturers of Electrical Supplies and Apparatus and are unjust in their application that the best means of defense is offered by the co-operative methods of the Association. This talk by Mr. Nicholson which is very briefly reported in these minutes occupied about two hours time and without question marked the meeting as the most interesting and instructive ever held by the Section. Acknowledgment was expressed by a rising vote of thanks. Mr. Duryea emphasized the fact that the machinery for handling all matters of general interest to the Porcelain Section requiring any action by the Council was in full operation and available to its members.

The expense of membership was explained and application blanks distributed. Applications for membership from The American Porcelain Company, The Summit Porcelain Company, Inc., The Trenle Porcelain Co. and the W. Virginia Porcelain Company were filed with the Secretary, and the discussion following the remarks of Mr. Nicholson encouraged the belief that other applications will result. The meeting adjourned for lunch at 1 P.M., after which the Section proceeded with the regular order of business.

CALENDAR OF CONVENTIONS

American Association of Engineers—Norfolk, Va., May 7 to 9.
American Dental Trade Association—Spring Lake, N. J., June, 1923
American Electrochemical Society—Commodore Hotel, N. Y., May 3, 4, 5.
American Face Brick Association—First Week in December, 1923.
American Face Brick Association (Southern Group)—West Baden, Ind., November, 1923.

American Gas Association—Atlantic City, Week of Oct. 15, 1923.
American Institute of Chemical Engineers—Wilmington, Del., June 20–23, 1923.
American Society of Mechanical Engineers—Montreal, Can., May 28–31.
American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, June 25, 1923.
American Zinc Institute—St. Louis, Mo., May 7 and 8, 1923.
Canadian Institute of Chemistry—Toronto, Can., May 29 to 31, 1923.
Chamber of Commerce of the United States of America—New York City, May 8–10, 1923.
Clay Products Association—Chicago, Ill., Third Tuesday in each month.
Dental Manufacturers' Club of the United States—Spring Lake, N. J., June, 1923.
Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18, 1923.
Iron and Steel Institute (London)—House of the Institution of Civil Engineers, London, S. W. 1, May 10 and 11, 1923.
Manufacturing Chemists' Association—New York, June, 1923.
National Association of Manufacturers of the United States—Waldorf-Astoria Hotel, New York City, May 14 to 16, 1923.
National Association of Stove Manufacturers—Richmond, Va., May 9, 1923.
National Association of Window Glass Manufacturers—Place and date not determined.
National Board of Fire Underwriters—New York, May 24, 1923.
National Exposition of Chemical Industries (Ninth)—New York, Sept. 17 to 22, 1923.
National Foreign Trade Council—New Orleans, La., Postponed from April to May 2, 3 and 4.
National Gas Appliance Manufacturers' Exchange—Kansas City, Mo., May, 1923.
National Lime Association—Hotel Commodore, New York City, June 13 to 15, 1923.
National Paving Brick Manufacturers' Association, December, 1923.
National Symposium on Colloid Chemistry—University of Wisconsin, June 12 to 15, 1923.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Society of Chemical Industry (Canadian Section)—Toronto, Can., May 29 to 31, 1923.
Stoker Manufacturers' Association—May or June, 1923.
Society for Steel Treatment (Eastern Section)—Bethlehem, Pa., June 14 and 15, 1923.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN
of the
American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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Vol. 2 June, 1923 No. 6

PRESIDENT'S PAGE

It is not too early for the members of the Society to plan their summer vacations and it is the earnest desire of the officers that consideration be given this year to the Annual Summer Meeting as a means of spending a most delightful holiday with fellow ceramists to the Detroit district. The trip last year to Canada was a splendid success and much enjoyed by all those who attended.

The trip is planned for August 8, 9, 10, 11, and will consume four days. The itinerary with full details will be mailed to you shortly. Will you not plan to attend and bring the entire family? The ladies add so much to the pleasures of a trip of this kind.

The Committee appointments have now been made and it is sincerely hoped that all Committees will continue to function during the entire year. There is a tendency to drop Committee work during the summer months and leave most of the work until fall which leaves only a short period before the Annual Meeting. Due to vacations it is sometimes hard for a Committee Chairman to get action during the summer, but it is hoped that each Chairman will outline his work for the year and get these outlines into the hands of members of the Committee so that some thought may be given to the details during the next few months. Action will be so much easier to get in the early fall if this is done. As so much more can be accomplished if the Committees can get together during the year, will not each Chairman attempt to get at least some members of his Committee to attend the Sum-

mer Meeting? More real work can be accomplished on this trip in a few days than is possible in months through correspondence.

Practically all of the Divisions are now organized and their Committees should also begin to function. It is not too early for the Committee in charge of Papers and Programs to begin solicitation for papers for the Atlantic City Meeting. It is so much easier at this time to obtain promises of papers than if the matter is left until a month or two before the Annual Meeting.

Few members realize how splendidly the SOCIETY is beginning to function as a consulting agency. It is surprising the number of requests for information, both from members and non-members, which are sent in to the Secretary's office. These requests vary from the composition of glaze to men to fill positions in ceramic plants. Fortunately our versatile General Secretary is able to give the required information in almost every case without reference to other members, but when he is not able to do so members can always be found who are willing to give the requested assistance.

EDITORIALS

PIONEERING BEYOND THE RIM[1]

EDITOR'S NOTE.—We are indebted to the Editor of *Saturday Evening Post* for permission to reprint these paragraphs taken from a most excellently written and illustrated article on the value of industrial research. The reproduction of these paragraphs here is to give emphasis to the truths in them enunciated.

The nation that leads the world in business and commerce must lead also in research. Success today depends more on mental than material equipment. The vital need of the moment in America is for an additional 10,000 highly trained scientific investigators, each of whom may be used as a teacher or nucleus of research groups. Only in such a way can we effectively remedy waste, improve government, and rapidly develop the basic art of industrial chemistry. If we let other nations excel in research we must concede to them important advantages and be content to play a minor rôle in world affairs.

We have heard much talk about preparedness. Many people call attention to the fact that the earth has been in an almost constant state of war for 10,000 years. The truth is, that active, increasing research is the very best type of preparedness, not only for national defence but for industrial peace. The uncovering of buried treasures of new knowledge is the most effective way for a people to strengthen themselves.

When a nation stops discovering new things we have the first sign of sure decay. Though progress in research in the United States has been slow, it nevertheless is clearly evident. More than 1300 American companies have laboratories and about 10,000 men and women are employed in them. Most of our corporations engaged in scientific investigative work have linked up with governmental agencies, trade and technical organizations and universities, in a systematic effort to increase the speed of actual accomplishment through an interchange of ideas.

But though we have laid the foundation for a broad campaign of national research, the effort so far made represents only the first feeble steps of an infant industry. Dozens of great corporations continue to pay $100,000 a year for legal advice and $10,000 for scientific guidance. Most of these companies are run by executives who lack the ability to keep one jump ahead of their competitors on the modern plan of inviting inspection and therefore they endeavor to cover up their incompetence by resorting to the locked door and sharp practice. Industrial secrecy has done more than all else to retard coöperative research.

Thanks to some of our progressive leaders, and especially to our trade associations, the rank and file of American manufacturers are beginning to understand what research is, how much it costs, and why it pays. They have come to know that it is a mistake to rely upon governmental agencies to carry on scientific work that is designed to better their own particular business. They have learned that coöperation in research is absolutely essential, and that it is possible to improve life and yet make a profit on the operation.

If there is anyone who does not believe in the wisdom of having business and science coöperate for their mutual advantage, then a brief study of the industrial progress throughout the world in recent years should convince him.

It has been only a comparatively short time since we commenced to manufacture cement, and yet the use of concrete made of cement, with water and aggregate, is increasing in an amazing way. The infant cement industry grew so fast that the manufacturers

[1] Floyd W. Parsons (*Saturday Evening Post*, May 5, 1923).

had very little time to give to a scientific study of their product, and the result was a succession of failures in many construction jobs where concrete was used. Then the cement people decided to go in for research, and almost immediately the new knowledge developed served to put the industry on a basis of stability that did not exist before. Experiments were carried on to show what quality of concrete is most economical in certain lines of construction. Tests were established so that everyone might determine the suitability of available aggregates. Rules were formulated for proportioning, mixing and placing the material. Experiments were completed to show the effect of changes in the proportions of materials, and of the exposure to wear and weather. For years people who mixed concrete assumed that the only materials of importance were the cement, sand and pebbles or crushed stone. A short time ago the research workers obtained revolutionary results by proportioning the water in the concrete mixes. Now we know that the amount of water used is nearly as important as the solid materials, and today the cement industry is of a single mind with respect to the value of coöperative research on a national scale.

. . . . . The up-to-date executive lays out his research under five heads: First is the research to improve his everyday methods; second, research aimed at a specific commercial object; third, pure-science research, which has no immediate industrial object in view; fourth, research applied to public service, or investigations designed to study the needs of the consumer, and to analyze the fields of use of a manufactured product; fifth, there is research in standardization of procedures and products.

The sooner we all recognize the earning power of research, the sooner we shall get on a highway leading to a state of prosperity that will be far more satisfactory and permanent than any we have ever yet enjoyed. One manufacturer was wasting $100,000 a year on raw materials purchased without regard to moisture content. Now he has learned the importance of the accurate control of moisture. On one railroad the boiler tubes of switch engines had an average life of seven months. It cost $1200 to replace a set of tubes. Research has extended the life of the tubes to thirty-one months, and the company has 1600 locomotives. A large gas company uses 3500 barrels of gas oil a day. The management recently spent $350,000 in developing a cracking process all their own. As a result they now get a 27 per cent yield of gasoline out of each barrel of oil. The remaining oil is 7 per cent better for their purpose than it was before the gasoline was removed. As a result of this research the company is saving $1.24 on each barrel of oil, or $4,340 daily. Here is a scientific achievement that pays 100 per cent interest every eighty days.

A great many people are coming to believe that it is safer and better to judge the future of a corporation or an industry by its fixed attitude toward research than by its working capital, its past earning power or its fixed assets. Scientific investigation is the only wise and economical way to stop waste and indefinitely postpone the exhaustion of our natural resources.

FRANK P. JUDGE'S STATEMENTS OF VALUE OF INDUSTRIAL RESEARCH

At the annual meeting of the United States Potters' Association held in New York City in April, Frank P. Judge, Jr., president of the Association was among the prominent speakers for the occasion. A part of his address of especial interest to the members of the American Ceramic Society is reprinted from the *Evening Review*, of East Liverpool, Ohio.

"For years our forefathers toiled along as best they could contenting themselves with the results they obtained under adverse manufacturing conditions but the progress of time and the demand from the consumer made it imperative for us to give thought and attention to the improvement of our product. The full significance of this did not dawn upon us until importations of foreign dinner ware were curtailed by reason of the recent World War which practically put all manufacturing at a standstill, exclusive of such as was necessary to the conduct of the war and to provide the actual necessities of the people. The American potter was not slow to realize that his opportunity was at hand and the past few years have seen many changes in our manufacturing processes. We are proud of the fact that our products today are far superior in body, glaze, art and design than they were a few years ago.

"We must not stop with our accomplishments of today but we should exert every effort to continue the perfection of our wares so that we shall eventually be able to supply all the demands of our home consumption and, in addition, develop an export trade. To do this we cannot follow along the same lines as we did years ago encountering difficulties and not knowing how to overcome them other than to work all angles on the problem until it was solved—consequently we were still in the dark as to the cause of the trouble.

"It is a well known fact that the progressive industries of today do not rely upon past experience handed down from generation to generation but are solving their manufacturing problems in their research laboratories with technically trained men, spending their time studying ways and means to reduce losses in the course of manufacture, better and more economic methods, testing materials and lastly, but not least, the betterment of the product. A few of our largest potteries are now maintaining their own research laboratories and look upon them as one of their most valuable assets. A smaller pottery needs the service of the technical man just as much as the large one but the needs of the small pottery hardly justify the maintenance of a research department. To take care of the small potteries it is suggested that a research laboratory be established at a central point (in the name of the United States Potters' Association) which would be in charge of a Ceramic Engineer whose service would be available to any member of our association at any time, the member paying for the individual service he would receive. When not engaged in doing work for an individual factory the ceramic engineer could be conducting experiments, studying raw materials, methods of firing, fuels, etc. It is my sincere hope that before this meeting adjourns some action will have been taken on this matter. Our industry is expanding and the work of our Association should expand with it.

"At the last annual meeting a new committee was created. It is known as our research committee and in the short space of time it has been functioning, much valuable information has been furnished our members. The outstanding feature of the work of this committee during the past year was to interest the United States Bureau of Standards in working out some of our problems. On October 27th, 1922 a fellowship was established at the Bureau to work on one of our greatest problems—that of crazing. A ceramist is now making a systematic study of this and we are looking forward to receiving an interesting report from this fellowship later on in our program. In addition to working on the crazing question the Bureau is also experimenting with sagger clays to determine which clay or combination of clays will give us a sagger better than what we are now using.

"Considerable assistance can be given to the Research Committee by the kiln and fuel also the machinery committees by providing confidential and reliable reports on such subjects that would come under the work of the respective committees.

"Each succeeding year is finding a decided improvement in the artistic side of our

business and before very many more years pass into history the evil of imitating shapes, decorations, etc., will be stamped out.

"Each factory should put individuality into its product and the sooner we come to the realization of this just that much sooner will the keen competition of the past be eliminated. To stimulate activity along the line of originality in shapes and decorations a prize could be given each year by the United States Potters' Association to the individual suggesting the best designs for dinner services and to the decorator or artist offering the best suggestions for decoration.

"We might not feel the necessity of serious consideration of this subject at the present time but we must not forget that there is a day coming when everything is not as favorable as it is now and that will be the time when the product of fine quality, originality in shape and decoration will not need to fear competition, either foreign or domestic.

"You supply dealers can be of valuable assistance in carrying on this work. The best materials obtainable should be brought to our attention and the decalcomania dealers could assist by refusing to make decorations which they know are already on the market and by keeping their lines free of decorations that are similar in design and appearances. This would not benefit the potter alone, but should materially benefit the decalcomania manufacturers. I cannot urge upon you too strongly to give serious thought to this side of our business. Let each one of us leave this meeting with a firm resolve to make our respective products original and recognizable by their individuality."

SCIENTIFIC RESEARCH ENTERS NEW ERA

Activities of Engineer Organizations

Scientific research, affording new channels for the aspirations of the engineer, is entering upon a new era both here and abroad. Following the $500,000 gift of Ambrose Swasey of Cleveland, making possible the organization of Engineering Foundation, comes news from London that Sir Alfred Yarrow has given the same amount to the Royal Society for the same purpose.

The philanthropy of Sir Alfred, who is an honorary member of the American Society of Mechanical Engineers, is characterized as another step toward the identity of effort which engineers and men of science are striving to accomplish throughout the Anglo-Saxon world.

"I should like to record my firm conviction that a patriotic citizen cannot give money, or leave it at his death, to better advantage than towards the development of science, upon which the industrial success of the country so largely depends," said Sir Alfred in his deed of gift.

PAPERS AND DISCUSSIONS

REPORT OF COMMITTEE ON STANDARDS[1]

By Walter A. Hull[2]

The Standards Committee wishes to present to the Board of Trustees the accompanying specification for Limestone, Quicklime and Hydrated Lime[3] for use in the manufacture of glass. This specification was prepared by Mr. A. E. Williams for the Interdepartmental Conference on Chemical Lime, which is a conference made up of representatives of interested governmental departments. It has been approved by the Interdepartmental Conference and by the Standards Committee of the Glass Division of the American Ceramic Society and it should be stated in this connection that members of the Glass Division were consulted freely during the preparation of the specification. Subsequent to its approval by the Standards Committee of the Glass Division, slight revisions were made. These revisions were approved by the Interdepartmental Conference. The revised specification was then submitted to letter ballot of the Standards Committee of the American Ceramic Society. This Committee now recommends that the specification be adopted as a Standard of the Society.

Since the various Divisions of the Ceramic Society have been organized, with Standards Committees of their own, the General Committee on Standards has automatically become, in large measure, a coördinating committee. The work of developing tests and preparing specifications for materials which are used or produced by members of one Division only, properly belongs to the Standards Committee of that Division. The duty of the General Committee on Standards in such a case is to give the specification a final inspection before recommending that the Society adopt it as a standard. One of the objects of this inspection by the Standards Committee is to make sure that there is no conflict with and no unnecessary duplication of the specifications submitted by other Divisions. In the case of a material or product of interest to more than one Division, it is a proper function of the General Committee on Standards to act as a clearing house or coördinating agency.

Until within the last couple of years the work of the American Ceramic Society on standards has been almost wholly along the line of methods of testing clays and one or two types of ceramic products. In other words, the standards which have been given a definite status by the Society are almost wholly standard methods for laboratory workers. Very recently, say within the last two or three years, there has been more of a tendency to try to devise suitable specifications for use in the purchase of materials such as feldspar, flint, whiting and limestone which are purchased in quantity by members of the Society. Thus we find specifications pro-

[1] See "Tentative Specifications for Glass House Refractories," *Bull Amer. Ceram. Soc.*, 2 [3], 29 (1923).

[2] Chairman, Committee on Standards. [3] See p. 170, *This Bulletin.*

posed for refractories for glass tanks; feldspar, flint and whiting for the whiteware industry; and limestone, quicklime and hydrated lime for glass manufacture. One of these proposed specifications is now definitely recommended for adoption as a Standard of the SOCIETY. It is expected that the Whitewares Division may approve one of the others at the 1923 Annual Meeting so that it can be considered by the General Standards Committee for presentation to the SOCIETY at the 1924 Annual Meeting. It is hoped that the work already done on specifications for feldspar may be materially supplemented by the coming colloquium, and that satisfactory specifications for feldspar for certain specific purposes may be added to the Standards of the SOCIETY within reasonable time.

There is an opportunity for practically every Division to work on specifications for materials purchased by members of the Division. It is predicted that as one after another of the Standards Committees of the different Divisions begin to give active attention to this work, it will be found that the Divisional Standards Committees need strengthening by adding active, representative members to the personnel of these Committees. In order that the SOCIETY may do constructive work in the preparation of specifications, each Divisional Standards Committee must be so representative that a specification that is put up to a Division for action will represent the best thought obtainable in the Division. In order to work most effectively, it would be necessary for the Divisional Standards Committee to assemble in committee meetings at intervals and work out questions pertaining to specifications. Whenever the group of manufacturers represented in a given Division gets to be "sold" on the value of specifications for the materials purchased or the products sold, it will become possible to secure attendance at such meetings. In the meantime, it is almost a primary essential for every Divisional Standards Committee which is going to function to have a chairman or secretary who can obtain stenographic assistance.

It is believed that suitable specifications for use in the purchase of materials alone will result in a large saving in costs and reduction in factory troubles to members of the SOCIETY. It may not take long for the first specifications put in force to show results, and results will give the movement an impetus quicker than anything else.

THE ANALYSIS OF HIGH ALUMINA PRODUCTS[1]

BY C. A. UNDERWOOD

Introduction

With the recent introduction of refractory products having an alumina content from 60 to 85%, it may prove desirable to discuss the method of

[1] Read before the Refractories Division, Pittsburgh Meeting, February, 1923.

analysis employed with such refractories. In this class are included diaspore, bauxite, spinel and the various products made from these materials.

Considerable detail is given in order that the operator may proceed without the trouble of devising the technic and to help him over the pit falls.

Ordinary clays can be thoroughly decomposed by fusion with sodium carbonate. For diaspore and similar materials either sodium or potassium pyrosulphate must be used. The burnt products can be fused directly whereas the raw material must be calcined to drive off the combined water. Otherwise the diaspore will float on the fusion and crawl up and over the wall of the crucible, causing loss of part of the sample and preventing the remainder from being acted upon by the pyrosulphate. This makes it advisable to determine the loss on ignition first.

"Loss on Ignition"

Exactly one gram of the sample, which has been dried at 105°C for one hour and cooled in a desiccator, is weighed into either a platinum or porcelain crucible and heated for 30 minutes at not less than 1000°C. The ignition may be conducted in an electric furnace or over a good blast, care being taken that all samples receive the same treatment. Different operators may obtain slightly different results owing to differences in the temperature of their blasts. Hence the "loss on ignition" is a somewhat variable determination.[1] Owing to decrepitation it is necessary in some cases to raise the heat gradually.

Solution of the Sample

The sample on which the ignition loss has been determined is transferred from the crucible to an agate mortar and pulverized. An amount corresponding to 0.5000 of the original (crude) sample is then weighed out and mixed with 10 to 15 grams of fused potassium pyrosulphate. To illustrate: Assume the loss on ignition to be 13.50%. Then $\frac{100.00-13.50}{100} \times 0.5000 =$ .4325 gram, the amount necessary to weigh out.

This procedure has two advantages: first, there is time saved, and secondly, the size of the alumina precipitate will be smaller.

The fusion requires about three hours, beginning with a very low flame and gradually increasing until the sample is thoroughly decomposed; a condition which exists when flocculent silica is seen in the melt. If there is any undecomposed material adhering to the wall of the crucible, it can be brought into solution by carefully removing the cover and tilting the crucible so that the melt may act upon it.

[1] W. F. Hillebrand, "The Analysis of Silicate and Carbonate Rocks," U. S. Geol. Surv., *Bull.* **422**, p. 231.

When the fusion has cooled the button is removed from the crucible and the crucible and cover placed in a 400-cc. beaker containing 150 cc. of dilute hydrochloric acid (1—1). Heat gently on the hot plate until crucible and cover are clean. Remove, add the button to this solution and continue to heat until solution takes place. The solution will finally become clear, only the silica remaining undissolved.

Silica

Transfer to a porcelain evaporating dish and evaporate as nearly to dryness as possible. It is impossible to remove the last traces of acid on the water bath, but by occasionally breaking up the crust that forms, very nearly all can be driven off. Dryness is accomplished by supporting the evaporating dish about two inches above the top of a hot plate, care being taken not to heat too rapidly so that spattering takes place. By this means all acid can be removed and the silica dehydrated.

Fifty cc. of dilute hydrochloric acid and 150 cc. of hot water are now added and heat applied until all except the silica is in solution. Filter through a 11 cm. filter paper, receiving the filtrate in a 400-cc. beaker. The silica is washed six times with cold water and six times with hot water, after which it is ignited and weighed in a platinum crucible.

Moisten the impure silica with a few drops of water; add two drops of concentrated sulphuric acid and 10 to 15 cc. of hydrofluoric acid. Evaporate (do not boil) until the sulphuric acid has been expelled, ignite and weigh. The difference in the two weights represents the true silica.

If desirable, the filtrate can be again evaporated to dryness, but this is unnecessary for ordinary work.

Alumina, Iron Oxide, and Titania

The residue from the hydrofluoric acid evaporation usually amounts to 5 milligrams or less and consists of alumina, iron oxide, and titania. It is fused with one or two grams of potassium pyrosulphate and when cold is dissolved in the filtrate obtained from the silica separation. The solution now contains all the constituents to be determined except the alkalies. It is transferred to a 500-cc. graduated flask and filled to the mark. Mix thoroughly and pipette 200 cc. into a 400-cc. beaker.

Pass hydrogen sulphide through the solution for ten minutes or until all the platinum is precipitated. Heat to boiling to coagulate. Filter into a 600-cc. beaker and bring to boil to expel the hydrogen sulphide. Add bromine water to oxidize the iron, and continue to boil until the excess bromine has been driven off. Dilute to 450 cc.

There is an appreciable error caused by the solution of platinum during the pyrosulphate fusion. This must be removed; otherwise the alumina

will be high. It takes considerable time, however, to throw out the platinum with hydrogen sulphide and then reoxidize. For general work, this can be avoided by weighing the platinum crucible before and after the fusion. The loss in weight is then deducted from the weight of the alumina precipitate.

After expelling the bromine, the alumina, iron and titanium are precipitated with ammonia, using rosalic acid as an indicator. It is best to add the last drops of ammonia from a pipette so that the color change can be followed closely. Allow the precipitate to settle and filter through a strong 12.5-cm. filter. Rinse the beaker with hot dilute ammonium nitrate solution to get all on the filter and then wash five times, breaking up the precipitate in order to wash it thoroughly.

Save the filtrate and redissolve the precipitate into the original beaker with hot dilute hydrochloric acid (1—1). Dilute to 450 cc. and precipitate as before. On filtering scrub the beaker clean and wash five times with the ammonium nitrate solution. Save the filtrate.

The alumina precipitation is the most difficult part of this analysis and unless every precaution is exercised, good results cannot be obtained.[1] The precipitate should not be washed with pure water but either with dilute ammonium nitrate or chloride. Also the volume of the solution should not be less than specified. The large amount of fixed alkalies present are adsorbed by the alumina precipitate and are difficult to remove. Pure ammonia, as recommended under "Reagents," is likewise necessary since any error introduced in this way is multiplied many times in the result.

After the alumina precipitate has drained for a short time, it is placed in a platinum crucible of sufficient size and dried; care being taken not to lose any by spattering. It is then ignited, blasted for twenty minutes, cooled in a desiccator and weighed with cover on. A second blasting for ten minutes will show if constant weight has been obtained.

Iron

The combined oxides of aluminum, iron and titanium are fused with ten grams of fused potassium pyrosulphate, exercising all the precautions necessary in pyrosulphate fusions. When all has been dissolved allow the fusion to cool. Remove the button to a watch glass by gently tapping and place the crucible and cover in a 150-cc. beaker. Add 75 cc. of water and 10 cc. of conc. sulphuric acid. Heat gently until the crucible and cover are clean. Remove and add the button to this solution. Continue to heat gently until the fusion is completely dissolved and transfer the solution to a 500-cc. Erlenmeyer flask.

[1] William Blum, "The Determination of Alumina as Oxide," Bur. Stand., *Sci. Paper*, No. 286.

The Erlenmeyer flask is supported at a convenient angle and hydrogen sulphide passed through until the platinum sulphide is all precipitated. Bring to boil and filter into another Erlenmeyer flask of the same size. Again pass hydrogen sulphide through the solution until the solution becomes cloudy owing to the presence of free sulphur. Complete reduction can be determined by testing a drop of the solution with potassium sulphocyanate.

The flask is now removed to the hot plate and supplied with a Bunsen valve. On boiling gently the solution will first become clear and finally all traces of hydrogen sulphide will be expelled. This point is ascertained by moistening a piece of filter paper with lead acetate solution and allowing the escaping steam to play upon it. When the filter paper fails to turn black, all hydrogen sulphide has been driven off.

The Bunsen valve is removed and the iron titrated with N/25 potassium permanganate. The permanganate is added slowly while the solution is given a rotary motion. The end-point is reached when a pink flash is obtained throughout the whole solution. Two drops excess will color the solution for several seconds.

Titanium

After the titration of iron the solution is transferred to a 250 cc. graduated flask. When cool, 5 to 10 cc. of hydrogen peroxide free from fluorine are added and the flask filled to the mark. Pipette 50 cc. of this solution into a Nessler tube.

Pipette 10 cc. of a standard titania solution containing approximately 0.001 gram per cc. into a 100-cc. graduated flask. Add 5 to 10 cc. of hydrogen peroxide and fill to the mark. After mixing add 10 cc. to a second Nessler tube and add water from a burette until the color matches that of the test solution. From the results calculate the percentage of TiO_2.

Large amounts of iron and alkali sulphates interfere with this determination. In this class of products, however, only a small amount of iron is found and there is sufficient sulphuric acid present to prevent interference by the alkali sulphate.

In comparing the colors it is best to use some form of colorimeter. Otherwise the shadows produced make the comparison difficult.

Alumina

By deducting the iron and the titania from the total alumina precipitate ($Al_2O_3 + Fe_2O_3 + TiO_2$) the percentage of alumina is found.

Calcium Oxide

The two filtrates from the alumina, iron and titania precipitations are combined and evaporated to about 400 cc. Bring the solution to boil

and add 25 cc. of saturated ammonium oxalate solution and a few cc. of ammonia. After continuing the boiling for one or two minutes longer, set the solution back on the hot plate so that it will remain hot but not boil. Evaporate in this way to a volume of approximately 250 cc. Remove from the hot plate and allow to stand over night. Filter, wash the precipitate of calcium oxalate two or three times. Save the filtrate. Redissolve the precipitate into the original beaker with dilute hydrochloric acid (1−1).

Dilute the calcium solution to 250 cc. Heat to boiling, add a few cc. of the ammonium oxalate solution and precipitate with ammonia. Heat again to boiling and allow the precipitate to settle for two hours, keeping hot. At the end of this time, filter off the precipitate. Wash six times with hot water.

To the beaker used for the precipitation, add 150 cc. of water and 6 cc. of concentrated sulphuric acid. Heat to about 70°C and introduce the filter paper containing the precipitate of calcium oxalate. Titrate with $N/25$ potassium permanganate, allowing for the effect of the filter paper. Calculate the percentage of CaO.

Magnesia

Combine the filtrates from the calcium oxalate precipitations and evaporate to about 400 cc. Dissolve one gram of sodium-ammonium phosphate in a little warm water and add to the solution. Next add 100 cc. of ammonia, and allow to stand at least twelve hours.

At the end of this time filter off the precipitate, rejecting the filtrate. Redissolve the precipitate into the original beaker with dilute nitric acid (1−5). Dilute to 150 cc. and again precipitate with 5 cc. of the sodium-ammonium phosphate solution and 50 cc. of ammonia. Allow the precipitate to stand four or five hours; filter, and wash well with cold water to which 5% ammonia has been added.

The precipitate can be collected either in a Gooch or on filter paper. Where filter paper is used it should be burnt off very slowly. The electric furnace is ideal for igniting magnesia.

Finally weigh the precipitate as $Mg_2P_2O_7$ and multiply the weight by 0.3621 to reduce it to MgO.

The addition of 50 cc. of alcohol will facilitate the precipitation of the magnesium-ammonium phosphate.

Potash and Soda

The alkalies are usually determined by the J. Lawrence Smith method. The description of this method given by Washington[1] may well be consulted where detail and great accuracy are desired.

[1] H. S. Washington, "The Chemical Analysis of Rocks," 191 (1919).

Pulverize about one gram of the sample in an agate mortar until it is reduced to an extremely fine powder. Weigh out 0.5000 gram and place in the clean agate mortar. To this add one-half gram of ammonium chloride and mix thoroughly with the aid of the pestle.

Approximately 4 grams of calcium carbonate are now weighed out and added to the mixture in two or three portions, care being taken to thoroughly mix the three ingredients. It is desirable that each particle of the sample be in contact with a particle of calcium carbonate, and a particle of ammonium chloride.

A small amount of calcium carbonate is now tamped into the bottom of a platinum crucible; the mixture is then added and covered with an additional portion of the carbonate. The crucible is covered and warmed gently for 15 minutes after which the heat is increased until only the lower half of the crucible is a dull red. Continue to heat in this way for 45 minutes. The heat is then removed and the crucible allowed to cool.

To a platinum or porcelain basin add 50 to 75 cc. of water and cover with a watch glass. When the fusion has cooled introduce the crucible and contents and also the cover. Allow to stand a short time and remove the crucible and cover. The melt is now broken up with the acid of the agate pestle and the liquid brought to boil. Decant into a 600-cc. beaker. Break up the residue, add 100 cc. more of water and bring to boil again. Decant as before. This operation is repeated the third time except that the contents of the basin are transferred entirely to the filter. The residue is then washed several times with hot water.

To the filtrate, which should have a volume of 300–400 cc., add 3 or 4 cc. of ammonia and bring to boil. In the meantime about 2 grams of ammonium carbonate are dissolved in cold water, and added until complete precipitation takes place. Keep hot and allow the precipitate of calcium carbonate to settle. Filter into two six-inch porcelain evaporating dishes and evaporate nearly to dryness. Transfer both solutions to a platinum basin or a three-inch evaporating dish and continue the evaporation to dryness.

The next operation is to expel the ammonium salts by gentle ignition with a moving flame. Finally bring the basin to dull redness to remove the last traces of salts, care being taken to avoid heating the alkalies above their melting points. Allow the basin to cool and add 25–30 cc. of water. Tip the basin to insure solution of the soluble salts and add two drops of ammonium oxalate. Evaporate again almost to dryness. Take up with 5–10 cc. of water and filter into a platinum crucible of 35-cc. capacity. Rinse the basin and wash six times with small amounts of hot water. Add two drops of dilute hydrochloric acid and evaporate the solution to dryness. Ignite gently to expel the ammonium salts, care being taken to avoid decrepitation and volatilization of the alkalies. When the crucible has cooled take up again in 5–10 cc. of warm water and again

filter. This time the filtrate is received in a weighed platinum crucible of 35 cc. capacity. Evaporate, ignite gently, and weigh as NaCl + KCl.

Separation of Potash[1]

The chlorides as obtained above are dissolved in the crucible with about 5 cc. of water and a definite amount of chloroplatinic acid added. If the solution of chloroplatinic acid contains 0.05 gram of platinum per cc., the result will be the number of cubic centimeters of chloroplatinic acid to be added. In order to be certain that an excess of the platinum solution has been used it is well to add a few drops excess. In this class of work 1 cc. will be sufficient in practically all cases.

The crucible is now placed on the water bath and allowed to simmer. If the precipitated potassium platini-chloride does not dissolve when the liquid is warm, a few cc. of water are added to effect its solution. Evaporate until the liquid becomes syrupy and solidifies on cooling. Allow the evaporation to cool and fill the crucible half full with alcohol of 0.86 specific gravity and allow to soak.

When all but the precipitated platini-chloride has gone into solution, the solution is decanted through a Gooch filter. Wash several times by decantation using the specified alcohol and finally transfer the precipitate to the filter. Continue the washing several times. Remove to an air bath at 130° to remove all traces of water. When this has been accomplished remove to a desiccator and when cool weigh as K_2PtCl_6.

Multiply the weight of potassium platini-chloride by 0.1938 to reduce to K_2O. Also multiply the weight of the platini-chloride by 0.307 to reduce it to KCl. This result deducted from the weight of the total chlorides gives the weight of the NaCl, which in turn is multiplied by 0.5308 to reduce it to Na_2O.

Summation of Results

There are on record, analyses which total 102 to 103%. These are obviously much too high and as a rule the error is not due to high results on all the constituents. It is more likely attributable to one determination and that determination is alumina.

Owing to the nature of the alumina precipitate, it is capable of adsorbing large amounts of fixed alkalies. Hence, great care must be exercised in washing it properly. Secondly impure ammonia, and failure to remove the platinum taken up during the fusion will add still more to this constituent.

An analyses which totals above 100% is usually better than one which totals below. There are always small amounts of impurities in the re-

[1] H. S. Washington, *op. cit.*, 202.

agents and considerable dust is collected before the analysis is finished. There are also minus errors which may occur but they are usually overbalanced by the plus ones. In the course of a great many analyses on products running from 60 to 85% Al_2O_3, it has been found that the summation of the constituents given will be between 100% and 100.50%. It should be emphasized, however, that these results can be obtained only by exercising the necessary precautions. Where there is a great amount of work to be done and where speed is an important consideration the allowable limit might be extended to 101%.

Solutions Required

Acids.—The concentrated acids used have specific gravities approximately as follows:

Hydrochloric Acid	1.20
Sulphuric Acid	1.84
Nitric Acid	1.42

Ammonium Carbonate.—Make up as needed by dissolving 1 to 2 grams in cold water.

Ammonium Hydroxide.—The concentrated ammonia water of 0.92 specific gravity is used. It should be free from carbonates and should not be kept in glass bottles. To purify, redistil over lime and store in ceresine bottles or in the regular five-pint acid bottles which have been coated inside with ceresine. If ammonium carbonate is the only impurity present, the ammonia water can be boiled to decompose the carbonate.

Ammonium Nitrate.—Neutralize 20 cc. of concentrated HNO_3 with ammonia until the solution is just alkaline to rosalic acid. Dilute to 1 liter.

Ammonium Oxalate.—It is best to recrystallize this after filtering to free from calcium oxalate. Dissolve 1 gram in 50 cc. of water when needed.

Chloroplatinic Acid.—Of that containing about 37 per cent platinum, 10 grams are dissolved in 50 cc. of cold water. Filter through a small filter into a reagent bottle and make up to 75 cc.

Hydrogen Peroxide.—Merck's "Superoxal" is used.

Potassium Permanganate.—Make up a normal solution by dissolving 31.6 grams in 1 liter of water. Dilute this to approximately 25th normal. Allow to stand at least one week and standardize with sodium oxalate prepared for such work by the U. S. Bureau of Standards.

Titanium Standard Solution.—Either potassium titanofluoride (K_2TiF_6) or titanium oxide (TiO_2) may be used. To prepare with K_2TiF_6, the salt is heated one hour at 150°C to drive off moisture. To 1.5 grams in a platinum crucible add 5 grams of sulphuric acid (1—1). Evaporate until fumes of sulphur trioxide are given off strongly but do not take to

dryness. Repeat four or five times. When cool add 5 cc. of sulphuric acid and cautiously dilute with water. Add enough more sulphuric acid so that there will be at least 5 per cent of the final volume. Allow to cool and dilute to the mark in a 500-cc. graduated flask.

Mix the solution well and pipette off 50 cc. and dilute with water. Bring to boil and precipitate with ammonia water. Filter, wash well, ignite and weigh as TiO_2. Fuse the TiO_2 with potassium pyrosulphate, dissolve the melt, and determine the Fe_2O_3 present by potassium permanganate after reduction with hydrogen sulphide. Deduct this from the TiO_2.

The titania solution if made up as directed will contain approximately 0.001 gram TiO_2 per cc.

If TiO_2 is used instead of K_2TiF_6 0.5 gram is taken. It is either fused with potassium pyrosulphate or evaporated with a mixture of hydrofluoric and sulphuric (1−1) acids. Finally evaporate with sulphuric acid (1−1) several times and make up to 500 cc. as described above.

American Refractories Co.
Joliet, Illinois

TESTING BARIUM CARBONATE FOR USE IN TERRA COTTA BODIES

By W. L. Howat and G. A. Williams

ABSTRACT

The value of barium carbonate for neutralizing soluble salts in a terra cotta body depends upon its activity when in contact with soluble salts. An activity test is given.

The value of barium carbonate for use in a terra cotta body to neutralize the soluble salts depends upon its activity when in contact with these soluble salts. Since the activity of a given sample of barium carbonate cannot be judged by its purity, or solubility in water or dilute hydrochloric acid, the following simple test has been adopted for this purpose.

Taking magnesium sulphate as a typical soluble salt the test is as follows:

Weigh out 2 grams of the barium carbonate sample and place in 100 cc. of a 10% solution of magnesium sulphate. Allow to stand 1 hour at 70°F (21°C) stirring at 10-minute intervals with a glass rod.

Filter and wash with warm water until no white precipitate shows when tested with barium chloride. Wash precipitate consisting of barium sulphate and barium carbonate which has remained unchanged into a beaker and treat with dilute hydrochloric acid. Collect the barium sulphate now remaining by filtering and washing with warm water until the filtrate is free of barium chloride as shown by testing with a drop of sulphuric acid.

Ignite and weigh. Correct this weight by subtracting the weight of the barium carbonate sample which is insoluble in dilute hydrochloric acid.

Convert weight of barium sulphate into terms of barium carbonate ($BaSO_4$: $BaCO_3$ = 233:197), then this weight divided by weight of sample of barium carbonate taken, times 100 equals per cent of barium carbonate which has reacted with the magnesium sulphate.

A modification of this test might also be used with equally satisfactory results, but since the per cent of barium carbonate reacting in such a test depends upon (1) the concentration of the soluble sulphate salt used, (2) the kind of soluble sulphate used, (3) the temperature, and (4) the time, it is obvious that for purposes of comparing different samples of barium carbonate over a period of time, the test must be carried out on a standard procedure.

Results to show the magnitude of the variation from these different causes are as follows, with a given sample of barium carbonate used for all tests:

Test no.		Per cent of barium carbonate reacting
1	Regular magnesium sulphate test as given	25.6%
2	Using double strength magnesium sulphate	42.5%
3	Using an equivalent amount of sodium sulphate (10.9 grams of $Na_2SO_4 7H_2O$ instead of 10 grams of $MgSO_4 7H_2O$)	73.5%
4	Using regular 10% solution of magnesium sulphate but standing for 1 hr. at 100°C instead of 21°C	78.3%
5	Regular test but standing 5 hrs. instead of 1 hr.	33.3%

It is evident from these results that in the body the longer the body is aged and the warmer the temperature, the more effective the barium carbonate will be in reacting with soluble sulphates in the body.

Effect of Fineness of Barium Carbonate

To determine whether the fineness of the barium carbonate had any effect on the per cent reacting with magnesium sulphate, the regular test was run on Sample A, as received, and after grinding 8 hrs. dried in a small jar mill. A sieving test was made before and after grinding. Regular magnesium sulphate test and sieving test was also made on a different lot of barium carbonate—Sample B.

Results	Sample "A" as received	Sample "A" ground 8 hrs.	Sample "B" as received
On 60-mesh	2.29%	0.10%	1.84%
On 100-mesh	1.16	0.62	0.60
On 120-mesh	1.86	2.51	0.26
On 150-mesh	1.39	1.55	0.79
On 200-mesh	1.83	2.92	0.90
Pan	91.47	92.30	95.61
Per cent reacting with magnesium sulphate	29.0 %	32.8 %	27.4 %

We concluded then, that while grinding a sample of barium carbonate finer would increase its activity, a sieving test comparison between two different samples would not show which was the more active. It is probable that the degree of fineness of the 90% or more through 200-mesh sieve which an ordinary sieving test will not classify has more effect on activity than the size of the 10% or less above 200-mesh.

The following are some typical figures obtained on various samples of barium carbonate

Sample no.	Insoluble in dilute HCl	Per cent reacting with $MgSO_4$
1	3.30%	31.5%
2	2.60	33.5
3	.0	31.8
4	.0	33.3
5	2.3	26.8
6	0.95	27.4
7	0.65	29.2
8	1.68	25.1
9	2.60	34.6
10	2.56	34.5
11	2.30	22.8
12	3.72	13.7
13	10.10	16.0
14	98.30	..

Below 25% reaction in the magnesium sulphate test makes the value of a sample of barium carbonate doubtful.

Atlantic Terra Cotta Co.
Perth Amboy, N. J.

PROPOSED TENTATIVE FELDSPAR SPECIFICATIONS[1]

Since the last Annual Meeting, 1922, the Committee has been in correspondence with several producers and large consumers of feldspar.

The consumers are a unit as regards specifying the characteristics of the feldspar they purchase. As might be expected the producers see many difficulties in the way. However great and real these difficulties are, they must be surmounted to the end that the industries which give to feldspar its value may enjoy a greater measure of freedom from uncertainty and consequent loss.

Specifications for commercial feldspar and flint by A. W. Watts,[2] have assisted us all, as well as the thorough work published as Bulletin 53, of the Bureau of Mines 1913, on the "Mining and Treatment of Feldspar and Kaolin."

[1] The Discussion accompanying these specifications which took place at the Whiteware Division Meeting, Pittsburgh, will appear in an early issue of the *Bulletin*.

[2] *Jour. Amer. Ceram. Soc.*, 3 [9], 722 (1920).

It has become the practice of certain manufacturers to use more than one kind of feldspar and ground to various degrees of fineness. Feldspar millers are now grinding finer than was the common practice of even two years ago. In this connection a series of valuable suggestions have been received from Mr. G. E. Sladek calling attention to the fact that at the present time feldspars in use are of definitely different composition and definitely different grinding characteristics.

Specifications for Commercial Feldspar for Use in the Manufacture of Whiteware

In view of the above it is suggested that Prof. Watts' specifications be amended as follows:

1. The Sample.—In sampling car-load lots, equal amounts should be taken from at least five different points in the car, no two samples being taken within five feet of each other. In sampling from a bin, five separate samples shall be taken from different portions of the bin and not more than two from the same level. The total sample shall not be less than ten pounds.

The samples shall be thoroughly mixed on a smooth surface, divided in halves, one-half spread evenly over the other half. Repeat this operation five times. The mixed sample shall then be quartered and two quarters not adjoining rejected. The remaining quarters shall be mixed as described above, five times, quartered as before and two quarters rejected. The remaining sample shall weigh more than 2.2 pounds (1 kilo.) and shall be placed in a tight receptacle, marked with an identifying number or with the name of the material, car or bin number and data on which the sample was taken.

Chemical Composition

Grade	K_2O%	Na_2O%	CaO.MgO%
	above	below	not above
A	10	3.6	0.75
B	9	3.2	1.00
C	7.8	2.8	1.00
	not above	not below	
D	3.0	7.0	1.00

Physical Properties and Tests

1. Color and Specking.—Bearing in mind the variety of wares in which feldspar is used and the various standards as to color and specking, potters find it necessary to establish; it is considered desirable to leave this matter open to agreement between vendor and vendee.

2a. Fineness of Grain.—One hundred grams of the sample, after being dried to constant weight at 105°C, shall be tested for fineness of grain according to the process set forth in paragraph 2b and the residues on the various sieves shall not exceed the maxima as set forth in the following table:

Screen no.	100	140	200	270	325	Total residue
Grade 1	0.25	0.5	1.25	2.0	5.0	9%
Grade 2	0.50	1.0	2.5	4.0	6.0	14%
Grade 3	0.75	1.25	3.75	5.0	8.0	18.75%

For the screen analysis the Standard Screen Scale sieves are used the openings increasing in the ratio of the fourth root of 2 or 1.189 as recommended in *Year Book*.[1] All percentages are made on the dry basis.

2b. Method of Making the Fineness Test.—The 100 grams of dry sample shall be transferred to the sieve and over a sieve pan which fits closely enough to prevent loss by slopping. The pan shall contain sufficient water to reach within not less than $^3/_4$ inch (20 mm.) or more than $1^1/_4$ inch (31 mm.) from the pan. The sieve and pan shall be vibrated or shaken in such a manner that water in the pan is splashed on the screen from below so as to wash the powder about and cause the material that can pass through the sieve to pass into the pan below. This treatment shall be continued until no more material can be removed.

The residue and sides of the sieve shall then be thoroughly washed with water by means of a laboratory wash bottle.

2c. The Washing Process.—In the washing process a fine brush may be used to break down such small aggregates as refuse to break up by washing alone.

The order of the sieves shall be as follows: Wash the sample on the 325-mesh sieve to remove all fines, as this facilitates an accurate classification of the coarse material. The material passing this sieve may be concentrated by evaporation to dryness and weighed, or may be immediately thrown away and its amount determined by difference. The residue on the 325-mesh sieve is transferred to the 100-mesh and washed as described above. The material on the sieve is dried and weighed; the material passing the 100-mesh sieve is transferred to the 140-mesh sieve and washed and this process continued to the 200, 270 and 375 in order, the residues on each being dried and weighed.

Note: In the water ground feldspar some lumps persistently refuse to break up. I have found it very difficult to completely wash the material without some aid of this sort and have experienced no objectionable results from a soft brush.

3. Moisture Content.—Unless otherwise specified the purchase price shall be based on moisture free material and the moisture content shall be determined as follows: 50 grams of the sample (paragraph 1) are carefully weighed out as soon as possible after sampling, and placed in an oven where a temperature between 105°C and 110°C is maintained with proper ventilation till the sample ceases to lose weight, the loss in weight shall be calculated to per cent of the dry weight and so reported.

In case a suitable chemical balance is available the moisture test may be determined on a 5 gram sample.

4. Fusion Behavior.—Test cones of the feldspar shall be made of standard dimensions, *i. e.*, $2\ ^7/_8$ inches high (75 mm.) by $^9/_{16}$ inch (15 mm.) across the base of one face. The use of an organic bond, such as dextrine or gum arabic, is permissible to ensure cones retaining form prior to fusion, but such added material must burn out completely and not affect the color of the fired material. The fusion behavior of the different feldspars shall be as follows for the grade 2 grind.

Grade A Feldspar shall fuse with or before Orton cone 9
Grade B Feldspar shall fuse with or before Orton cone 8
Grade C Feldspar shall fuse between Orton cones 7 and 8
Grade D Feldspar shall fuse with or before Orton cone 7

5. Shipping.—All material purchased under these specifications shall be shipped in clean closed cars.

6. Rejection.—The purchaser reserves the right to reject material which does not conform to the above specifications in every particular and to return rejected material to the vendor for full credit at price charged f.o.b. point of delivery specified by the purchaser.

[1] *Year Book*, Amer. Ceram. Soc., p. 36 (1922–23).

PROPOSED TENTATIVE SPECIFICATIONS COVERING THE PURCHASE OF PULVERIZED FLINT

To Be Used in the Manufacture of Whiteware

1. Sample.—Same as paragraph 1, Feldspar Specifications.[1]

2. Chemical Composition.—The material shall conform to the following limits of chemical composition.

Silica, not less than	99.60%
Potash and Soda, not more than	.15%
Iron Oxides, not more than	.05%
Lime	.10%
Magnesia, not more than	.10%
Alumina, not more than	.10%

Physical Properties and Tests

3a. Color.—The flint when formed into a standard cone and fired in a closed sagger or muffle to a temperature of cone 8 shall have a pure white color both on the surface and the interior and shall be easily broken by the fingers, indicating no fusion.

3b. Fineness of Grain.—One hundred grams of the sample after being dried to constant weight at 105°C shall be tested for fineness of grain by the process set forth in paragraph 2b, Feldspar Specifications, and the residues on the various standard sieves shall not exceed the maximum totals as set forth in the following table.

	Standard Sieve Number					
Grade	100	140	200	270	325	Total residue
1	0.10%	0.2%	1.50	2.00	5	8.8%
2	0.50%	1.0%	2.50	3.50	6.5	14.0

All percentages are calculated on the dry basis.

3c. Moisture Content.—Unless otherwise specified the purchase price shall be based on the moisture free material and the moisture shall be determined as described under paragraph 3, Feldspar Specifications.[2]

3d. Fusion Behavior.—Test cones shall be made of the material according to standard dimensions, *i. e.*, 2 7/8 inches (75 mm.) by 9/16 inch (15 mm.) across the base of one face. An organic bond as dextrine or gum arabic is permissible to insure the cones retaining their form prior to fusion, but such added material must burn out completely and not affect the color of the material. The flint when made into cones as described above shall not deform before cone 24.

3e. Shipping Conditions.—All material purchased under these specifications shall be shipped in clean closed cars.

4. Rejection.—The purchaser reserves the right to reject material which does not conform to the above specifications in every particular and to return rejected material to the vendor for full credit at price charged f.o.b. point of delivery specified by the purchaser.

[1] See p. 163, *This Bulletin.*

[2] *Ibid.*

DISCUSSION ON "SPECIFICATIONS ON FLINT"

H. SPURRIER:—A slight change has been made from the specifications made by Prof. Watts in that the rejections cover the whole shipment rather than a part. It seems an injustice to the shipper to reject part of his shipment and force him to handle the rest at less-than-carload-rates.

F. S. HUNT:—I think that there should be several grades of fineness, and that some grades of flint should not require such fineness of grain.

H. SPURRIER:—That is why two were specified. One is allowed .1% and the other is allowed .5% on 100-mesh. Grade 1 would allow .2% on 140-mesh, and grade 2 would allow 1% on 140-mesh; 200-mesh would be 1.50% for No. 1 and 2.50% for No. 2; 270-mesh would be 2.00% for No. 1 and 3.5% for No. 2; 325-mesh would be 5.0% for No. 1 and 6.5% for No. 2; with a total residue on grade 1 of 8.8% and on grade 2, 14.0%. This composition comes well within the range of published analyses. Some firms offer 99% to 99.9% silica. One company in particular that sells large quantities of flint runs 99.7% and a little over SiO_2 and to put that requirement at 99.5% seems to be well within industrial limits. This protects the consumer from carelessness.

B. E. SALISBURY:—Have any of the flint producers checked this and commented on it?

H. SPURRIER:—No one has seen it since these are only proposed specifications.

B. E. SALISBURY:—I suppose that it is the idea of the Committee to work in collaboration with the raw materials producers. We can set up standards satisfactory to us but they will not mean anything without the consent of the producers. We must have the backing of the raw materials producers or we can make no progress.

H. SPURRIER:—I have a published analysis of a firm producing flint and inasmuch as they have published it and presented it to prospective purchasers it becomes a specification. This producer states that his flint contains 99.8% SiO_2; alumina, .17%; oxide of iron, .104%; lime, 0; magnesia, 0. He offers you 99.8% SiO_2. Others too, offer that high.

F. K. PENCE:—The alumina seems a little low here in the specifications.

H. SPURRIER:—I have other analyses here. Another one shows 99.75% SiO_2; .06% Al_2O_3; commercial flint. This is taken from my private card index which I have kept for a number of years and I have more than one hundred analyses. They are samples offered to the industry and accepted as working material by the producers.

F. K. PENCE:—Alumina is not particularly harmful only as it cuts down the silica content. Much good quality flint will run higher than 1% alumina. In the case of the analysis read by Mr. Spurrier, I know that the concern in question puts out a high grade flint, yet they have an anal-

ysis showing .17% of alumina. This is not serious for it only reduces the SiO_2, but it is not as bad as if it had that much lime or iron. I think that the maximum on alumina might well be raised.

C. C. TREISCHEL:—It might be well to explain the manner in which we intend to proceed with these specifications. They have been referred back to the Division by the divisional Committee on Standards. This Division must recommend to the Standards Committee of the SOCIETY as a whole either the adoption of such a specification or its adoption in a tentative way with certain reservations. We must, however, take action of some sort.

ERIC TURNER:—From the grinders' standpoint, I do not believe that there is anything in particular to live up to. From the producer's standpoint we do not know. We have taken a grade of sand that certain consumers have required.

F. K. PENCE:—We have given two grades on the grinding. We might have another set of specifications on analysis as well.

H. SPURRIER:—I think that it would be entirely proper that we increase the alumina. There is an automatic check there. The presence of Al_2O_3 would imply other things. The SiO_2 would be reduced so as not to come within the specifications. I think the Al_2O_3 should be raised but 99.5% does not seem too exacting.

B. E. SALISBURY:—Would it be feasible to specify the minimum silica content? We might establish limits of impurities, the total of which shall not exceed the difference between the minimum and 100%.

ERIC TURNER:—The specifications for flint seem to be entirely feasible from the producers point of view with one exception. The standard set for the fineness of grain is rather higher than that of the general run of flint marketed to the whiteware trade. In my short experience the average grind of several producers has run a little over 1% (one) residue on a standard 140 test screen. It is not hard to produce flint ground to .2% residue on the above screen but the finer the grind the higher the miller's power bill and therefore the consumer should be expected to pay such a price as would compensate the miller for increased costs.

F. S. HUNT:—I think that it would be well to specify the silica in harmful ingredients but omit the alumina entirely. The silica would take care of that.

H. SPURRIER:—That is similar to the action taken on specifications for other materials. For instance, iron analyses and brass impurities are specified. In similar specifications, in iron or steel, phosphorus is specified. Flint is one thing that we can specify very closely. And I do not think it out of order to keep close watch on the other materials.

F. K. PENCE:—You intend to put them in before alumina?

H. SPURRIER:—Yes.

B. E. SALISBURY:—Mr. Pence, is it the idea to leave the other elements specified. Of those I think that it is highly important to have a limit on the iron oxide at least.

F. K. PENCE:—Iron oxide, .05. What do you think of adopting the other items and leaving the alumina out of it?

H. SPURRIER:—If that means retaining the 99.6%, I am agreed to it.

A motion was made by Mr. Hunt, seconded by Mr. Spurrier and adopted that the proposed specifications for flint stand as given except that under "Chemical Composition" no mention be made of the alumina content.

A motion was then made by Mr. Treischel, seconded by Mr. Salisbury and adopted that the specific action for flint, as amended be adopted by the White Wares Division and recommended to the Standards Committee for action according to the method prescribed by the rules of the SOCIETY.

R. B. LADOO:[1]—The composition of flint as given in the specifications automatically rules out all hydrous or opalescent silicas such as tripoli, diatomaceous earth, true flint, chalcedony, chert, etc., because these materials all contain more or less combined water and do not usually run as high as 99.6% SiO_2. The iron content should be governed by the color of burned test specimens and not by absolute percentage. In other words the method of taking care of the iron content in flint should be the same as that used in the feldspar specifications.

I believe that under composition should be stated only the maximum permissible amounts of harmful impurities such as lime and magnesia, leaving out impurities which are only diluents such as alumina, potash and soda.

I have in mind a hydrous silica tested by a plant ceramist of unquestionable ability and good judgment. This silica had a rather high content of chemically combined water, over 1% alumina and only about 90% silica; yet it was found to be of high grade and perfectly well adapted for the manufacture of the best grades of whiteware.

I do not believe that the flint specifications should be so rigidly drawn as to exclude high grade silica very low in harmful impurities, but which contains much less than 99% SiO_2 due to a high content of combined water and to small amounts of alumina, potash and soda. While it is true that flint is bought for its content of SiO_2 a slightly lower silica content in a hydrous silica might easily be compensated for by a lower price. Aside from harmful impurities such as iron, lime and magnesia the physical properties of the flint should govern and not the chemical properties.

Under paragraph 2, of the Flint Specifications, should be noted the more rapid and efficient method of making sieve tests as described in my discussion, paragraph 2b, in the Feldspar Specifications.

[1] Recd. April 27, 1923.

RECOMMENDED SPECIFICATIONS[1] FOR LIMESTONE, QUICKLIME AND HYDRATED LIME

For Use in the Manufacture of Glass

ABSTRACT

A general description of the use of lime in glass manufacture is followed by definitions of the terms "limestone," "quicklime," and "hydrated lime," and a statement as to the commercial packages in which these materials are marketed.

The quality of lime used in glass manufacture may vary. Any lime containing more than 83 per cent of the oxides of calcium and magnesium is suitable for glass manufacture, provided only that certain particularly deleterious substances are within reasonable limits. The composition should not vary from day to day more than 2 per cent. The material should all pass a No. 16 sieve.

Complete directions for sampling, testing, and retesting are included.

General

1. Use of Lime in Making Glass.—Most common glasses are fused mixtures of alkali (usually soda), alkaline earth (usually lime), and silica. Freedom from color is important in determining the quality of glass, which, in turn, depends upon the absence of coloring oxides (usually iron) from the raw material.

Limestone, quicklime, or hydrated lime may be used for making glass. The decision as to which to use is generally based on availability, cost, and present practice.

2. Definition of Limestone, Quicklime, and Hydrated Lime.—Limestone consists essentially of calcium carbonate, or of calcium and magnesium carbonates where the amount of the latter does not exceed 45.5 per cent. Quicklime is the product resulting from the calcination of limestone and consists essentially of calcium oxide, or of calcium and magnesium oxides. It will slake when water is added to it, and this slaking is accompanied by an evolution of heat and an increase in volume. Hydrated lime is a dry powder which is made by treating quicklime with enough water to satisfy its chemical affinity under the conditions of manufacture. It consists essentially of calcium hydroxide, or of a mixture of calcium hydroxide and magnesium oxide or hydroxide.

3. Packing.—Limestone is shipped in bulk in carload lots, or in cloth or paper bags. Quicklime is shipped either in bulk in carload lots or barrels holding 180 pounds net or 280 pounds net each. Hydrated lime is shipped in paper bags holding 50 pounds net each.

Requirements

1. Quality.—Except for the constituents enumerated below, the composition of a limestone, lime, or hydrated lime may vary within wide limits and still be satisfactory to the glass manufacturer. Either high calcium or high magnesium material may be used. It is essential, however, that the composition be reasonably uniform from day to day. Otherwise the difficulty of controlling the process of manufacture would become too great.

2. Composition.—Quicklime shall not contain more than 3 per cent CO_2 as shipped. Hydrated lime shall not contain more than 5 per cent CO_2 as shipped, and shall contain sufficient water to meet the chemical requirements of the calcium oxide.

Limestones, quicklimes, and hydrated limes may be divided into three classes,

[1] Issued by Department of Commerce, Bureau of Standards, *Circ.* **118,** Dec. 8, 1921.

depending upon the character of glass for which they are suitable. To meet these specifications, the constituents listed below shall not exceed the maximum percentages nor fall below the minimum percentages given in the following table:

TABLE I

COMPOSITION OF THE NON-VOLATILE PORTION OF LIMESTONE, QUICKLIME OR HYDRATED LIME

Ingredients	Class 1		Class 2		Class 3	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
$CaO + MgO$	...	96	...	91	....	83
Fe_2O_3	0.2	..	0.4	..	0.8	..
$SO_2 + P_5O$						
(*a*) In Limestone	1.0	..	1.0	..	1.0	..
(*b*) In Quicklime or Hydrated Lime	3.0	..	3.0	..	3.0	..
SiO_2	4.0	..	9.0	..	17.0	..
Al_2O_3	3.0	..	5.0	..	5 0	..

The sum of the calcium and magnesium oxide is specified in the above table. In order to prevent undue variation in the relative proportions of these two ingredients the per cent calcium oxide shall be established by contract, and it is specified that the per cent calcium oxide shall not vary more than 2 per cent either way from the contract figure.

An approximate figure for the content of alumina should also be included in the contract. This figure must come within the limits set in the above table, and it is specified that the amount of alumina in the material delivered shall not vary more than 1 per cent either way from the contract figure.

3. Fineness.—Unless otherwise specified, limestone, quicklime, and hydrated lime shall be crushed so that all will pass a No. 16 sieve.

NOTE.—A No. 16 sieve has an opening of 1.19 mm. and a wire diameter of 0.54 mm., with a permissible tolerance of 2 per cent in the opening and 10 per cent in the wire diameter.

4. Marking.—Each carload of material, or fraction thereof, shall be legibly marked with the names of the consignor and consignee, and with some means of identifying the particular contract on which the shipment is made.

This information is in addition to that required by the Federal lime-barrel law.

5. Retesting.—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor within 10 days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within 5 days of receipt of the notice of rejection. The consignee shall provide all reasonable facilities to permit the consignor to resample the material. This retest shall be at the expense of the consignor.

Sampling and Testing

1. Sampling.—The purchaser will bear all expense of sampling and testing. When limestone or quicklime is shipped in bulk, the sample shall be so taken that it will represent an average of all parts of the shipment from top to bottom, and shall not contain a disproportionate share of the top and bottom layers, which are most subject to changes. The sample shall consist of 1 shovelful for each 3 tons of material, but not less than 10 shovelfuls, taken from different parts of the shipment. The total sample taken shall weigh at least 100 pounds, shall be mixed thoroughly, and "quartered" to provide

a 15-pound sample for the laboratory. In case a shipment consists of more than one car, a separate sample shall be taken from each car.

When quicklime is shipped in barrels, at least 3 per cent of the number of barrels shall be sampled. They shall be taken from various parts of the shipment, dumped, mixed, and sampled as specified in the above paragraph.

In the case of hydrated lime, the sample shall be a fair average of the shipment. Three per cent of the packages shall be sampled. The sample shall be taken from the surface to the center of the package. The material so obtained shall be thoroughly mixed and quartered to provide a 2-pound sample for the laboratory.

When sampling quicklime or hydrated lime, it is essential that the operation be conducted as expeditiously as possible, in order to avoid undue exposure of the material to the air. The sample to be sent to the laboratory shall immediately be placed in an air-tight container in which the unused portion shall be stored until the shipment has been finally accepted or rejected by the purchaser.

The sample may be taken either at the point of shipment or at the point of destination, as agreed upon by the contracting parties. If it is desired to enforce the requirement as to carbon dioxide, the sample must be taken at the point of shipment.

2. Testing.—The following directions are a brief summary of the analytical methods which are recommended. For more complete information on this subject references should be made to "The Analysis of Silicate and Carbonate Rocks," by W. F. Hillebrand, United States Geological Survey, Bulletin No. 700.

Blast 0.5 g. of the sample for 15 minutes in a platinum crucible. Cool and transfer to an evaporating dish. Mix to a slurry with distilled water. Add 5 to 10 cc. concentrated HCl. Heat gently until solution is complete, breaking up lumps if necessary. Evaporate to dryness on water bath. Add 5 to 10 cc. concentrated HCl and dilute with an equal volume of distilled water. Digest on water bath for 10 minutes. Filter and wash with hot water. Evaporate the filtrate to dryness. Dissolve in acid and water as before. Filter, and wash with hot water. Ignite the two precipitates together and weigh as silica and insoluble matter.

Dilute the above filtrate to 250 cc. Add HCl if necessary to insure a total volume of 10 to 15 cc. Make alkaline with NH_4OH. Boil until odor of NH_3 is barely noticeable. Filter, and wash slightly with hot water. Dissolve the precipitate with hot dilute HCl and repeat the precipitation as before. Filter and wash thoroughly with hot water. Ignite and weigh as oxides of iron, aluminum, and phosphorus.

To the filtrates from the above add a few drops of NH_4OH and bring to a boil. Add 25 cc. of a saturated solution of $(NH_4)_2C_2O_4$. Continue boiling until the precipitate becomes granular. Let stand until precipitate settles clear. Filter, and wash with boiling water. Ignite the precipitate, dissolve in dilute HCl, and dilute to 100 cc. Add excess of NH_4OH, and boil. Filter out any insoluble matter, ignite and weigh, and add its weight to the oxides of iron and aluminum found previously. To this filtrate add $(NH_4)_2C_2O_4$, proceeding as before. Filter, and wash with boiling water. Ignite, and blast to constant weight as calcium oxide.

Acidify the filtrates from the above with HCl. Evaporate to 150 cc. Add 10 cc. of a saturated solution of $NaNH_4HPO_4$ and boil. Cool. Add NH_4OH drop by drop, with constant stirring, until the precipitate starts to form. Then add moderate excess of NH_4OH. Stir for several minutes. Let stand over night. Filter, and dissolve the precipitate in hot dilute HCl. Dilute to 100 cc., add 1 cc. of saturated solution of $NaNH_4HPO_4$, and precipitate as before. Filter, and wash with an alkaline solution made by diluting NH_4OH until it contains about 2.5 per cent NH_3 and then add a few drops of HNO_3. Ignite, and weigh as $Mg_2P_2O_7$. Multiply this weight by 0.3621 to find the weight of MgO.

Place 5 g. of the sample of quicklime or hydrated lime, or 0.5 g. of limestone, in a small Erlenmeyer flask and cover with hot distilled water. Connect this flask into a carbon-dioxide train, set up as follows: Next to the flask is a reflux condenser, to which is connected a calcium-chloride drying tube, followed by a tube containing anhydrous $CuSO_4$, then another tube of $CaCl_2$, then by two tubes filled with soda lime, and finally by another tube of $CaCl_2$. The entire train must be so arranged that a stream of CO_2 free air can be kept passing through it. Start this stream of air. Weigh the tubes containing soda lime and replace them in the train. Add to the sample in the flask about 25 cc. of 1:1 HCl, being careful that no gas is lost and that the effervescence is not too violent during the operation. When the effervescence diminishes, heat the flask, bringing the liquid gradually to boiling. Boil for 10 minutes. Remove the flame and allow the flask to cool while the stream of air is still flowing, for 15 minutes. Disconnect and weigh the soda-lime tubes. Their increase in weight is recorded as carbon dioxide.

Dissolve 5 g. of the sample in HCl and evaporate to dryness. Dissolve the residue in HCl, filter, and wash with hot water. Fuse the residue with Na_2CO_3. Treat the filtrate with NaOH in boiling solution, filter, and wash with hot water. Dissolve both this precipitate and the fused residue in dilute H_2SO_4. Reduce with Zn and titrate with $\frac{N}{20}$ $KMnO_4$. Calculate the result to per cent Fe_2O_3.

Dissolve 2 g. of the sample in 10 cc. water and 15 cc. 1:1 HCl. Filter out insoluble matter. Dilute filtrate to 250 cc. Heat to boiling and add 10 cc. of a boiling 10 per cent solution of $BaCl_2$, drop by drop, with constant stirring. Let stand over night, filter, wash with hot water, ignite, and weigh as $BaSO_4$. Calculate to per cent SO_3.

Dissolve 10 g. of the sample in 80 cc. of 1:1 HNO_3. Filter, wash, fuse the residue with Na_2CO_3, dissolve the melt in HNO_3, and add this solution to the filtrate. Boil the filtrate with 10 cc. of 1.5 per cent $KMnO_4$ solution until MnO_2 is precipitated. Add enough H_2SO_3 to dissolve the MnO_2. Neutralize with NH_4OH. Add 1 cc. of concentrated HNO_3 for every 100 cc. of solution. Bring to 40°C and precipitate with ammonium molybdate. Shake for 10 minutes and let stand at 40°C for 12 hours. Filter and wash with 1 per cent KNO_3. Dissolve the precipitate in a known volume of $\frac{N}{10}$ NaOH and CO_2 free water. Titrate the excess NaOH, using phenolphthalein as indicator. Calculate the per cent P_2O_5, using the proportion, P: NaOH = 1: 23.

SUGGESTED SPECIFICATIONS FOR CERAMIC WHITING[1]

A. General

1. Definition of Ceramic Whiting.—Ceramic whiting is a finely ground white powder composed of nearly pure calcium carbonate or calcium carbonate and magnesium carbonate obtained from pulverizing and sizing chalk, marble or limestone, or as a chemically precipitated product.

2. Use of Whiting in Ceramic Products.—Whiting is used to furnish the calcium oxide component of glazes, enamels, and fluxed ceramic bodies. It is an active fluxing agent, rarely used in large quantities in body mixtures. It may be either used as a raw ingredient in glazes, or fritted or smelted with other glaze materials before application.

[1] Revised April 7, 1923.

3. **Packing.**—Whiting is packed and shipped in barrels holding not more than 325 pounds or bags holding not more than 125 pounds. The package should be labeled stating whether the contents is a natural rock whiting or a chemically precipitated whiting.

B. Requirements

1. **Quality.**—Whiting shall be uniform in quality (from shipment to shipment), both as to fineness of grain and composition. The calcium, magnesium, or total carbonates shall not vary more than ±1% and the silica not more than ±1/2 of 1% of a figure set by contract within the limits of the composition shown in Class 1 or Class 2. It should be manufactured from the purest rock available and should be free from particles of pyrites, iron-bearing silicates, metallic iron and gypsum.

2. **Composition.**—Whitings shall be divided into two classes, No. 1 being practically a pure calcium carbonate and No. 2 containing calcium carbonate with a considerable percentage of magnesium carbonate within the limits of the composition given. This does not indicate that one class is inferior in quality to the other, but indicates that numerous users prefer the magnesium whiting to the pure calcium whiting.

Class 1

Material	Total carbonates	$CaCO_3$	$MgCO_3$	Fe_2O_3	SiO_2	SO_3
Maximum	..	..	1%	0.25%	2.0%	0.1%
Minimum	97%	96%	...	....	...	...

Class 2

Material	Total carbonates	$CaCO_3$	$MgCO_3$	Fe_2O_3	SiO_2	SO_3
Maximum	..	..	8%	0.25%	2.0%	0.1%
Minimum	97%	89%	..	....	...	...

3. **Fineness.**—Screening samples by washing for ten minutes with stream of water practically without pressure shall not leave a residue of more than 1% on a No. 140 screen (or more than 2% on a No. 200 screen), and at least 98% of the material shall pass a No. 200 screen. It shall also be so fine that a separation made by a Pearson[1] air separator will show at least 85% of the material finer than .02 mm. and at least 48% finer than .01 mm.

As an alternative to the Pearson air separator method the following (not so desirable) may be used: 2 1/2 gms. of the material shall be shaken for ten minutes in a 250 cc. cylindrical graduate with 250 cc. of distilled water. On allowing to settle it shall require not less than 20 minutes for visible settling to cease when the cylinder is viewed in reflected light, using clear north sky light for illumination.

4. **Marking.**—Each shipment of material shall be legibly marked with the names of consignor and consignee and with some means of identifying the particular contract on which the shipment is made.

5. **Retesting.**—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor within 10 days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within five (5) days of receipt of said notice.

[1] The Pearson air separator developed at the Bureau of Standards by J. C. Pearson and F. A. Hitchcock gives excellent separations of fine dry powders and is the only machine which can be used for this purpose for particles as small as .01 mm. Its use is therefore recommended for manufacturers and users of fine powder such as whiting, flint, feldspar, paint pigments, etc.

C. Sampling and Testing

1. Twenty-five per cent of the number of packages shall be selected for sampling.—A core representing the contents of each of these packages shall be taken with a sampling tube. The total material so collected shall weigh not less than 5 lbs. This shall be thoroughly mixed and quartered to provide a $^1/_2$-lb. sample for the laboratory.

2. Testing.—The following directions are a brief summary of the analytical methods which are recommended. For more complete information on this subject references should be made to "The Analysis of Silicate and Carbonate Rocks," by W. F. Hillebrand, United States Geological Survey, Bulletin No. 700.

Blast 0.5 g. of the sample for 15 minutes in a platinum crucible. Cool and transfer to an evaporating dish. Mix to a slurry with distilled water. Add 5 to 10 cc. concentrated HCl. Heat gently until solution is complete, breaking up lumps if necessary. Evaporate to dryness on water bath. Add 15 cc. concentrated HCl and dilute with an equal volume of distilled water. Digest on water bath for 10 minutes. Filter and wash with hot water. Evaporate the filtrate to dryness. Dissolve in acid and water as before. Filter and wash with hot water. Ignite the two precipitates together and weigh as silica and insoluble matter.

Dilute the above filtrate to 250 cc. Make alkaline with NH_4OH. Boil until odor of NH_3 is barely noticeable. Filter and wash slightly with hot water. Dissolve the precipitate with hot dilute HCl and repeat the precipitation as before. Filter and wash thoroughly with hot water. Ignite and weigh as oxides of iron, aluminum and phosphorus.

To the filtrates from the above add a few drops of NH_4OH and bring to a boil. Add 25 cc. of a saturated solution of $(NH_4)_2C_2O_4$. Continue boiling until the precipitate becomes granular. Let stand one hour. Filter and wash with hot water. Ignite the precipitate, dissolve in dilute HCl, and dilute to 100 cc. Add excess of NH_4OH and boil. Filter out any insoluble matter, ignite and weigh and add its weight to the oxides of iron and aluminum found previously. To this filtrate add $(NH_4)_2C_2O_4$, proceeding as before. Filter, and wash with boiling water. Ignite, and blast to constant weight as calcium oxide.

Acidify the filtrates from the above with HCl. Add 10 cc. of a saturated solution of $NaNH_4HPO_4$ and evaporate to 150 cc. Cool. Add NH_4OH drop by drop with constant stirring until the precipitate starts to form. Then add moderate excess of NH_4OH. Stir for several minutes. Let stand over night. Filter and dissolve the precipitate in hot dilute HCl.

Dilute to 100 cc., add 1 cc. of saturated solution of $NaNH_4HPO_4$ and precipitate as before. Filter and wash with dilute NH_4OH (25% NH_3 containing a few drops of HNO_3). Ignite and weigh as Mg_2P_2O. Multiply this weight by 0.3621 to find the weight of MgO.

Place 0.5 g. of the sample in a small Erlenmeyer flask and cover with hot distilled water. Connect this flask into a carbon-dioxide train, set up as follows: Next to the flask is a reflux condenser, to which is connected a calcium-chloride drying tube followed by a tube containing anhydrous $CuSO_4$, then another tube of $CaCl_2$, then by two tubes filled with soda lime, and finally by another tube of $CaCl_2$. The entire train must be so arranged that a stream of CO_2 free air can be kept passing through it. Start this stream of air. Weigh the tubes containing soda lime and replace them in the train. Add to the sample in the flask about 25 cc. of 1:1 HCl, being careful that no gas is lost and that the effervescence is not too violent during the operation. When the effervescence diminishes, heat the flask, bringing the liquid gradually to boiling. Boil for 10 minutes. Remove the flame and allow the flask to cool while the stream of air is still

flowing, for 15 minutes. Disconnect and weigh the soda lime tubes. Their increase in weight is recorded as carbon dioxide.

To five grams of the sample in a covered vessel, add 25 cc. of water, and then cautiously 10 cc. of concentrated hydrochloric acid. Break up any lumps with the flattened end of a glass rod and boil for 2 or 3 minuts. (1) Reduce the hot solution with a few drops of stannous chloride solution, cool, dilute to 100 cc., add 10 cc. of mercuric chloride solution, and titrate with standard potassium dichromate solution ($N/20$), using potassium ferricyanide as outside indicator. Calculate the results to Fe_2O_3. A blank determination is desirable for comparison.

The permanganate method for determination of total iron, as given by Blair in "The Chemical Analysis of Iron," may also be used.

Fuse 2.5 g. of the sample with about 10 g. of sodium carbonate, and dissolve the melt in 10% hydrochloric acid. (Any insoluble residue should be filtered off and tested by flame test for barium. If barium is absent, the residue may be rejected; if present, the residue should be again fused with an excess of sodium carbonate, and the water extract tested for SO_3.) Dilute the clear solution to 250 cc. heat to boiling and add slowly 10 cc. of hot 10% solution of barium chloride. Formation of a white precipitate indicates the presence of sulfur. A blank test should be made to insure the purity of reagents used.

(1) For extremely accurate work any insoluble matter may be filtered off at this point, ignited, fused with sodium carbonate, and the melt dissolved in 10% hydrochloric acid and added to the filtrate.

DISCUSSION ON "SPECIFICATIONS ON WHITING"

Led By H. H. Sortwell

Secretary C. C. Treischel:—The departments at Washington are very much interested in this specification but they want to get the final action from the American Ceramic Society before proceeding further with it.

H. H. Sortwell:—Last year Mr. Williams, of the Bureau of Standards, made a study of a good many different brands of whiting which were on the market. Samples were collected from different users and from the results of those tests they wrote these specifications. The definition of whiting is:

> Whiting is a finely ground white powder composed of nearly pure calcium carbonate obtained from pulverizing and screening chalk, marble or limestone, or as a chemically precipitated product.

That gives a wide range in the source of materials which may be used. The general requirements are:

1. **Quality:** Whiting shall be uniform in quality (from shipment to shipment), both as to fineness of grain and composition. The carbonates shall not vary more than —1% and the silica not more than —1/2 of 1% of a figure set by the contract within the limits of the composition shown under (*b*). It should be manufactured from the purest material available and should be free from pyrites, iron-bearing silicates, metallic iron, and gypsum.

2. **Composition.**—Whiting shall have the following limitations in composition:

Material	Total Carbonates	CaCO	$MgCO_3$	Fe_2O_3	SiO_2
Maximum	.....	...	2%	0.2%	4.0%
Minimum	95%	95%	...	...	...

B. E. Salisbury:—What do the analyses of the commercial firms show as to $CaCO_3$?

Chairman F. K. Pence:—I have a criticism of that specification. Here are some analyses: English cliffstone whiting SiO_2 out of analyses of four representative samples gave the silicate content slightly less than 1%. Another sample gave slightly in excess, 1.6%. I believe that 4% silica is too high. On domestic whitings analyses of four different samples from four different sources show silica contents of 1.28, 1.1, 1.03 and another one of 3.7%. Two per cent seems plenty high enough since even the last 3.7% is too high.

B. E. Salisbury:—Does that agree with the calcium content?

F. K. Pence:—No, there is another on that. I think that the magnesia is too low. English cliffstone will show 1.1% but domestic runs as high as from 5 to 7%. Many of these domestic whitings are perfectly good for industrial use. Hence I would criticize this specification on these two points.

H. Spurrier:—I agree in regard to the silica content. I have a number of analyses here. The first one is: Water, 0.16, carbon dioxide, 42.72; iron oxide and alumina, 0.61; lime, 53.44 (pure whiting would be 56%); silica, 2.09; magnesia, 0.08%. The magnesia is exceptionally low. Domestic materials run higher than that. However, in glaze making I think the magnesia content of 5% would be rather disturbing because of its important function. It usually increases the fluidity of the glaze in small amounts but its presence in larger amount decreases the fluidity. We ought to keep our magnesia reasonably low, but we might tolerate more than 0.08%. It should be about 2% maximum, as carbonate.

B. E. Salisbury:—That would bar a number of producers of whiting. At the same time it would save much trouble.

H. Spurrier:—That is what I have in mind. There are two things to consider: the buying and selling factors. Our own industry is the one that gives importance to these things and in regard to disturbing factors, the potters have enough to cope with. It is very difficult to operate a plant and get something constant if laboratory equipment is lacking. There is an urgent need for specifications or rather classification. Most of these things start out of the natural line, and you can't do very much. The process of manufacture doesn't improve from the point of view of composition. The final condition is improved, but since decisions have to be made more rapidly than the analyses, we ought to be able to place some

reliance on the goods. In the past we have had very little of that kind of assurance.

B. E. SALISBURY:—It seems to have been brought out that there are some kinds of work for which the domestic whiting is satisfactory. Could this not be handled like flint, by having two grades of whiting?

E. TURNER:—This method would be satisfactory if the gradation was not more than a certain amount. The magnesia should not vary more than one-half of one per cent from what they figure.

F. K. PENCE:—These specifications have provided for that. There seems to be a general consensus of opinion that 4% is too high for the silica content. I believe that 2% has been mentioned as the proper amount. Does anyone want to make a motion amending that portion of the specification?

B. E. SALISBURY:—I make that motion.

H. SPURRIER:—I second it.

C. E. JACKSON:—The Bureau of Standards never prepares any specifications that have not been drawn up with the full consent and advice of the producers. That specification has already come from the producers.

H. SPURRIER:—Some of these analyses show what the producers offer.

F. K. PENCE:—In chemical analyses there is seldom more than 2% of silica in either domestic or English whitings. That is too much in my opinion.

H. SPURRIER:—In one dozen analyses I have found but one whiting showing 3%. In my card index, covering a good many years there is only one showing 3%. Analyses which run higher do so from other reasons.

H. H. SORTWELL:—Might it not be a good idea to have two separate silica classifications?

P. H. BATES:—Then you are up against classifications and not specifications.

H. SPURRIER:—That probably is the final conclusion. You can classify, but not specify. Nature has done that for you.

F. K. PENCE:—As indicated by analyses from many different sources, it does not appear that 2% is unreasonable for silica content. We are ready to vote on the motions that we set the silica at not more than 2%.

The motion was put and carried that the silica content requirement of the specifications for whiting be set at not more than 2%.

F. K. PENCE:—It is questioned as to whether 2% is not too low a limit to place on the magnesia content. It is satisfactory for English cliffstone whiting but it would eliminate domestic whitings.

B. E. SALISBURY:—For purposes of discussion I move that we establish two classifications on whiting, Number 1 and Number 2.

F. K. PENCE:—May we have suggestions as to the limit?

C. E. JACKSON:—Magnesia, 5%.

F. S. HUNT:—Eight per cent.

F. K. PENCE:—I have 5.11, 7.23, 6.27, 6.21, 6.22.

A. V. BLEININGER:—These might be raised. If amounts of 5 or 6% do not do any harm I should be in favor of raising the magnesia content. I think that the limit of 5 to 6% would be satisfactory.

F. K. PENCE:—Most of the analyses on the domestics run over that amount.

A. V. BLEININGER:—Some of them run below that, but to be definite we might say 6% for magnesium carbonate.

H. SPURRIER:—The following analysis was made of waste material from the Solvay Process Company of Detroit. The silica was 1.62, magnesia (MgO), 4.77. This was made from the limestone of the Sibley Quarry near Detroit, which is partly dolomitic; $MgCO_3$, 9%; SO_3, .05%, that is, the sulphuric acid was originally sulphate. The lime ran 50 as CaO.

F. S. HUNT:—I do not believe that you can set a second classification at 6% unless you make a third at 8%.

F. K. PENCE:—It seems to me that you would have to include them in No. 2. No. 1 is going to eliminate them. It seems to me that you might as well let them in as to get within a per cent of it and cut them out.

C. E. JACKSON:—No. 2 gives a good range, but it will fill only a certain field. If we include all of the American whitings in No. 2, it would be their privilege to have a high magnesium.

It was moved by Mr. Jackson, seconded by Mr. Salisbury and adopted that the specifications for whiting be amended to include two classes, one with a magnesium content of 6% and the other with a magnesium content of 8%.

F. K. PENCE:—The iron content is all right, I believe. The analyses on English cliffstones show: .27, .263, .19, .196; domestic: .182, .204, .219; .2 seems quite close.

H. H. SORTWELL:—I think these figures were set from the results of analyses which were made from those samples examined at the Bureau of Standards. If .2 is considered too low, it might be all right to raise it to .25. That would match very well with the analyses already given.

F. K. PENCE:—I find there is some discrepancy in the iron content in whiting for this reason: In analyzing whiting it is dissolved in acid and the iron determination is made on solution. What remains is insoluble residue. If the two are put together it frequently runs over .2%.

H. SPURRIER:—A great many analyses are made where the iron oxide and alumina are together. For pottery purposes it is essential that the Fe_2O_3 is known. Very few manufacturers want to wait for analyses.

F. K. PENCE:—That is true. Mr. Mueller, what figure do you usually get out of the insoluble residue?

H. C. MUELLER:—For Fe_2O_3, I believe .3 of 1% could be used.

F. K. PENCE:—Do you recall whether you get .05 or .1 on the iron in the insoluble residue?

H. C. MUELLER:—One-tenth.

B. E. SALISBURY:—It is quite evident if the analyses you have on the best grade of whiting procurable run from .2 of 1% that it would be unwise to run over that on specifications.

F. K. PENCE:—I think that it is too close. In ground cliffstone rock there is more than .2 iron. There is no way of washing the iron from limestone rocks laid down by nature. Twenty-five hundredths is more reasonable and some are more than that.

H. C. MUELLER:—I know of one which was reported by the company which gave an Fe_2O_3 content of .14 of a per cent and English whiting usually runs .22 or .23. This was reported as .14.

F. K. PENCE:—It actually was as high as .22. We thought the difference was from the insoluble residue.

It was moved by Mr. Salisbury, seconded by Mr. Jackson and adopted that the iron content of whiting in the specifications be set at not more than .25%.

H. H. SORTWELL:—The proposed specification for fineness is as follows:

Fineness: Screening samples by washing for ten minutes with a stream of water practically without pressure shall not leave a residue of more than 1% on a No. 140 screen (or more than 2% on a No. 200 screen) and at least 98% of the material shall pass a No. 200 screen. It shall also be so fine that a Pearson air separator will show at least 85% of the material finer than .02 mm. and at least 48% finer than .01 mm.

In comparing these whitings there was a difference in grain fineness that would not be shown in sieves up to 200-mesh. The rest of the specification simply describes the details of sampling and testing the material. If these limits for fineness are satisfactory the points are all covered.

B. E. SALISBURY:—I should like to see a requirement that the producer shall put on his invoice and his container whether or not the whiting is precipitated.

This motion was approved by common consent.

G. SIMCOE:—I should like to suggest the point that the sulphur present indicates the presence of gypsum and this causes a great deal of trouble. The carbonates go off at a lower temperature when bodies are open and the gas escapes. The sulphates go off at a higher temperature when bodies are viscous producing pimples.

H. H. SORTWELL:—The specification states that if there were any considerable amount of sulphur the material would be rejected.

F. K. PENCE:—The point which covers that is under number 2*a* which says "It should be manufactured from the purest materials available and should be free from iron-bearing silicates, pyrites, metallic iron and gypsum. On the other hand we specify the iron content.

I. E. SPROAT:—Under 2*b* it also says: "The qualitative test described below shall indicate the absence of sulphur."

F. K. PENCE:—According to this, there should be no sulphur at all.

G. SIMCOE:—But it should be guaranteed.

B. E. SALISBURY:—That could be put under the impurities.

H. SPURRIER:—I have no actual data on this, but I have never found any sulphur. The qualitative test finds a heavy trace of some. But this point is very important.

F. K. PENCE:—I suppose this can be referred to the Committee and let them find out what it ought to be. Does anybody have any suggestion as to what limit should be stated in chemical analysis for sulphur?

C. E. JACKSON:—Preferably zero.

The use of whiting or Paris white for Ceramic purposes has been handed down to American potters largely by the English. The source of English whiting is the chalk cliffs of England. The whiting or Paris white made from these cliffs is remarkably pure and possesses physical properties peculiar to itself.

The uniformity of its chemical composition makes it the standard material and any whiting or Paris white should be compared with this material and classified accordingly. I suggest a specification defining the ideal chemical composition then placing a limitation on the permissible variation of any whiting or Paris white not coming within the limits being classed as a No. 2 whiting or Paris white.

Furthermore, the term whiting should not be used in Ceramic Literature unless whiting is desired. Whiting is made from the soft weathered English Cliffstone rock, while Paris white is made from the hard unweathered rock and is considered by English potters the better material for pottery purposes. Samples of the crude rock weathered and unweathered show quite a different physical structure. The unweathered rock would seem to be more uniform.

I. E. SPROAT:—I think whiting containing sulphur ought to be rejected.

F. K. PENCE:—I think the best way is to put this up to the Committee on Standards so that we can have something more than a general statement. There is some sulphur present but if we are running into a slug of gypsum we ought to be able to determine in these specifications a way to exclude it. By common consent we will incorporate into our instructions a definite limit on sulphur.

It was moved by Mr. Salisbury, seconded by Mr. Jackson and adopted that the specifications for whiting, as amended, be adopted by the White Wares Division and recommended to the Standards Committee for action according to the method prescribed by the rules of the SOCIETY.

A. E. WILLIAMS:—The Interdepartmental Conference Committee on Chemical Lime greatly appreciated the discussion of the whiting specifications, and the additional information and checking of figures against factory experience should make these specifications satisfactory and useful.

In accordance with the discussion, the specifications have been changed so that the maximum silica content is now only 2%, the allowable iron content 0.25%, and a figure for sulphur is provided allowing 0.1%.

The situation with regard to magnesium is slightly uncertain in that the motion adopted as recorded by the stenographer provides for two classes of whiting, one containing 6% and another 8% MgO. But judging from the context of the discussion, we are assuming that there are two classes intended, one a high calcium whiting allowing 2% of MgO, and another a dolomitic whiting allowing 8% MgO as a maximum. These maximums, together with the tolerances placed on the contents of CaO and MgO from shipment to shipment from any one dealer should provide a uniform raw material.

The revised specifications are attached herewith and further discussion is encouraged.

PROPOSED TENTATIVE SPECIFICATIONS FOR SILICA SAND FOR GLASS-MAKING

The specifications for limestone, burnt lime and hydrated lime presented to the Division last year have been handed to the Standards Committee of the SOCIETY to obtain approval of the SOCIETY. This specification has been slightly modified, allowing 3.0% of SO_3 and P_2O_5 in burnt and hydrated limes, this being because of the use of fuels containing sulphur in burning the stone.

The following is the tentative specification for glass sands submitted by the Committee for discussion. These specifications have been prepared by Committee on Standards of the Glass Section in coöperation with the Bureau of Standards.

General

(1) **Character of Sand.**—Sand as commonly used for glass-making purposes is a white, clean, dry, fine-grained quartz, washed practically free from all clay-like material and other impurities. The chief criterion for a good glass sand is that it should be practically all silica and contain very little iron.

In view of the increasing use of alumina in a glass batch and of the varying amounts of iron allowable in green or amber glass, sand of lower grade may be used by many manufacturers. These specifications, therefore, will show a variety of qualities and state more or less definitely the types of glass they may be used for. The quality number is not to be interpreted as necessarily being an index to value of the product.

Requirements

2. **Packing.**—Cars in which sand is to be shipped shall be thoroughly cleaned before loading, and lined with paper where sand is sold for first, second or third quality.

3. **Impurities.**—Sand shall not be contaminated with stripping dirt or contain any crushed stones or pebbles. These impurities are often insoluble in the melting glass, producing stones.

4. **Screening and Washing.**—All sand shall be screened, washed and dried before shipment, except where the natural condition of the quarries will allow the production by screening only of fourth, fifth, sixth or seventh quality sand.

TABLE I

PERCENTAGE COMPOSITION OF SANDS OF VARIOUS QUALITIES (BASED ON IGNITED SAMPLES)

Qualities	SiO_2 Max.	SiO_2 Min.	Al_2O_3 Max.	Al_2O_3 Min.	Fe_2O_3 Max.	Fe_2O_3 Min.	CaO + MgO Max.	CaO + MgO Min.
First quality optical glass	99.8		0.1		.02		0.1	
Second quality flint glass containers tableware	98.5		0.5		.035		0.2	
Third quality flint glass	95.0		4.0		.035		0.5	
Fourth quality sheet glass rolled and polished plate	98.5		0.5		.06		0.5	
Fifth quality sheet glass rolled and polished plate	95.0		4.0		.06		0.5	
Sixth quality green glass containers and window glass	98.0		0.5		0.3		0.5	
Seventh quality green glass	95.0		4.0		0.3		0.5	
Eighth quality amber glass containers	98.0		0.5		1.0		0.5	
Ninth quality amber	95.0		4.0		1.0		0.5	

5. Although sand may vary considerably in composition, depending on the type of glass to be made, the composition of any single quality specified shall not vary from shipment to shipment more than the amounts stated in Table II.

TABLE II

PERCENTAGE TOLERANCES IN COMPOSITION ALLOWED (BASED ON IGNITED SAMPLE)

Quality	SiO_2	Al_2O_3	Fe_2O_3	CaO + MgO	Rmx
1	±0.1%	±.05%	+0.005%	±0.05%	
2	±0.5	±0.1	+0.005	±0.05	
3	±1.0	±0.5	+0.005	±0.1	
4	±0.5	±0.1	+0.005	±0.1	
5	±1.0	±0.5	+0.005	±0.1	
6	±1.0	±0.5	±0.05	±0.1	
7	±1.0	±0.5	±0.05	±0.1	
8	±1.0	±0.5	±0.1	±0.1	
9	±1.0	±0.5	±0.1	±0.1	

6. Sand shall be prepared so that the size of grains shall be rather uniform and be within the limits set in Table III:

TABLE III

LIMITING PER CENTS OF VARIOUS SIZES OF SAND GRAINS

Through a No. 20 screen	100%
Through a No. 20 and remaining on a No. 40 screen	Not more than 60% nor less than 40%
Through a No. 40 and remaining on a No. 60 screen	Not more than 40% nor less than 30%
Through a No. 60 and remaining on a No. 100 screen	Not more than 20% nor less than 10%
Through a No. 100 screen	Not more than 5%

Methods of Testing

Screen tests shall be made with sand dried to 110°C, using United States Bureau of Standards standard screen sizes.

Methods of Analysis

To determine silica, lime and alumina, follow methods given in Hillebrand's Rock Analysis, U. S. G. S., Bulletin No. 700.

Iron may be determined by any of the following methods:

Colorimetric Method of Iron with Sulphocyanate.

Scott's Standard Methods of Chemical Analyses (*Bull.* **3**(1907)), page 222.

Electrometric Titration.

Stokes & Cain Method (Bureau of Standards).

The following method may be used for solution of the sands for any method of determining iron:

.5 gm. sample. Fuse in Pt crucible with four times wt. of pure Na_2CO_3. Dissolve in 200 cc. warm H_2O (warm on steam bath). Dilute 15 cc. of conc. HCl to 50 cc. Add this from a burette slowly, drop by drop to the solution, stirring frequently and keeping solution cold to prevent silica from separating out. The acid having been added, add a small amount of pure Zn (.05 gm.) to solution to precipitate out any Pt dissolved in the carbonate fusion. When Zn has dissolved, filter the solution into a 500-cc. graduated flask and proceed.

ACTIVITIES OF THE SOCIETY

WE ARE GROWING EVERY DAY IN EVERY WAY BIGGER, BETTER AND MORE EFFECTIVE IN SERVICE TO CERAMIC INDUSTRIES

The score board for the 1923 membership committee is as follows in net totals at each of the dates of record.

	Personal	Corporation	Total	Net gain by months
January 12	1571	213	1784	
March 14	1710	223	1933	149 (2 months)
April 14	1738	226	1964	31
May 14	1775	233	2008	44
Total net gain	204	20	224	

The record of the individual score getters during the fiscal month of April 15th–May 14th is as follows.

	Personal	Corporation		Personal	Corporation
R. K. Hursh		1	A. Malinovszky	1	
Howard Frost		1	C. W. Parmelee	1	
Charles W. Crane		1	Robert C. Rahn	1	
Frederick H. Rhead	2		Herman Reinbold	1	
R. R. Shively	2		Louis E. Rodgers	1	
A. S. Watts	2		S. Satoh	1	
D. F. Albery	1		J. B. Shaw	1	
E. E. Ayars	1		Alexander Silverman	1	
L. E. Barringer	1		Gaylord T. Stowe	1	
Arthur B. De Vol	1		E. W. Tillotson	1	
J. F. Greene	1		W. W. Wilkins	1	
Frank M. Hartford	1		W. G. Whitford	1	
Seiji Kondo	1		Office	12	4

Total 37 Personal
7 Corporation

The passing of the 2000 membership mark is noteworthy—but only in the passing. Two thousand members never was the goal, in fact the possible roster of ceramists whose industrial welfare is served by the SOCIETY is many times two thousand. When passing the 2000 membership mark the SOCIETY is merely starting on its way.

NEW MEMBERS RECEIVED FROM APRIL 15 TO MAY 14

PERSONAL

Agazim, Michael, 365 E. Illinois St., Chicago, Ill., Salesman, Wishnick-Tumpeer Chemical Co.

Booth, William K., 737 Addison St., Chicago, Ill., The Booth Electric Furnace Co., Secy. and Chief Engineer.

Brooks, John W., Avery and Whittier Aves., Syracuse, N. Y., Secy.-Treas., Pass and Seymour, Inc., Solvay, N. Y.

Carlstrum, C. G., 503 Perry Payne Bldg., Cleveland, Ohio, Manager, Refractory Products Company.

Cahoon, Chester P., 42 S. Main St., Salt Lake City, Utah.

Denison, Geo. W., 8829 Broadway, Cleveland, Ohio, Vice-Pres. and Gen. Manager, The Ohio Clay Company.

Drever, Horace, 908 Chestnut St., Philadelphia, Pa., Electrical Engineer, Manufacturing-Electric Furnace Construction Co.
Du Bois, Hassell Burton, Alfred, N. Y., Student, Alfred University.
Facer, Charles A., 1242 Oak Grove Ave., Steubenville, Ohio, Decorator and Designer, H. Northwood and Co.
Fick, Clarence W., General Electric Company, Schenectady, N. Y., Engineer in Power and Mining Department.
Galvin, Grover H., Rockford, Ia., Vice-Pres. and Gen. Mgr., Rockford Brick and Tile Co.
Gosser, George W., 438 S. 4th St., Coshocton, Ohio, Ass't Supt., Pope-Gosser China Co.
Grady, George Morrill, 74 Piedmont Rd., Columbus, Ohio, Student, O. S. U., Columbus.
Fuwa, Kitsuzo, 589 Araijiku Iriarai-Machi, Ebara-Gun Tokyo-Fu, Japan, Engineer, Tokyo Electric Co.
Hilgenberg, Carl G., % Carr Lowrey Glass Co., Fairmont, W. Va., President.
Hill, W. H., Murphysboro, Ill., President, Murphysboro Paving Brick Co.
Hoduker, W., Dipl. Ingenieur, Ilmenau, Thüringen, Germany.
Jackson, Will F., Olivet, Mich., Bird Artist.
Koyama, I., Technical College at Keijo, Korea, Japan.
Krause, Ellis L., 218 Fifth St., Marietta, Ohio, Prof. of Chemistry, Marietta College.
Lewis, J. H., Van Briggle Tile and Pottery Co., Colorado Springs, Colo., Secy. and Treas.
Marvel, P. A., Croze Bldg., Philadelphia, Pa., The Vitrifax Co.
Morton, William A., 1317 Fulton Bldg., Pittsburgh, Pa., President, Amsler-Morton Co., Inc.
Prowell, Harry D., 726 S. Hope St., Los Angeles, Cal., Pyrometer Engineer, Adolf Frese Corpn.
Pumphrey, M. E., 40 Rector St., N. Y. City, Salesman, General Refractories Co.
Rafter, Michael Joseph, 728 Plum St., Vineland, N. J., Manager, Kimble Glass Co.
Reinbold, Herman, 103 S. 18th St., Omaha, Neb., Pres., Reinbold Metallurgical Co.
Riddick, James W., Jr., 4702 Lexington St., Chicago, Ill., Methods Engineer, Western Electric Co., Hawthorn Sta.
Senn, William E., 808 W. Adams St., Sandusky, Ohio, Student, O. S. U.
Sondles, Merrill A., 421 S. 7th St., Coshocton, Ohio, Statistical Engineer, Pope-Gosser China Co.
Smith, Geo. O., Carr Lowrey Glass Co., Baltimore, Md., Chemist and Glassmaker.
Starr, C. D., 116 Point St., Providence, R. I., Supt., Rehoboth Porcelain Enamel Co.
Stein, Chas. M., 48 rue de la Boëtie, Paris, France, Fuel Engineer.
Trostel, Louis J., 103 Buell Ave., Joliet, Ill., Chief Chemist, American Refractories Co.
Wells, J. M., Newell, W. Va., Treas., American Potteries Co.
Yamuzawa, Itsuo, Nihon Chitsuso Hiryō Co., Minamatama-chi, Ashikitagumi, Kumamoto Ken, Japan.
Zimmer, W. H., Waldershof, Bavaria, Johann Haviland Porzellanfabirk.

Corporation

Armstrong Cork and Insulation Co., Pittsburgh, Pa., N. B. Gates, Pres.
Crossman Company, South Amboy, N. J., Charles W. Crane, Pres.
Illinois-Pacific Glass Co., Fifteenth and Folsom Sts., San Francisco, Cal., Otto Rosenstein, Vice-Pres.
Jointless Fire Brick Co., 1130 Clay St., Chicago, Illinois, Albert Goetz, Treas.
Olean Tile Company, Olean, N. Y., Gordon Phillips.
Pacific Clay Products Co., Los Angeles, Cal., E. M. Durant, Pres.
Weir Stove Co., Taunton, Mass., J. L. Anthony, Pres.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

A. E. Acheson has changed his address to 19 Kensington Ave., Jersey City, N. J.

Walter O. Amsler, formerly president of the Amsler-Morton Co., of Pittsburgh is now with the Owens Bottle Factory–1, 982 Wall St., Toledo, Ohio.

E. E. Ayars is living at 702 Jasper St., Joliet, Ill.

M. C. Booze of Mellon Institute has moved to Thackery and O'Hara Sts., Pittsburgh.

R. C. Brett has notified the Secretary's office that his address is 1697 Lee Road, Cleveland Road, Cleveland Heights, Ohio.

James E. Brinckerhoff, formerly of East Liverpool, Ohio, with the Babcock and Wilcox Co., has removed to 95 Liberty St., N. Y. City with the same company.

M. L. Bryan is now with the Columbia Terra Cotta Co., Box 788, Vancouver, Wash.

Dorothy Peck Chapman who has been living at East Orange, N. J., has moved to 23 Carolina Road, Montclair, N. J.

E. V. Coulston has left the Rock Island Stove Co., at Rock Island, Ill., and is living at 1265 E. 55th St., Cleveland, Ohio.

S. F. Cox has moved from Haverhill St., to 1011 Coal St., Wilkinsburgh, Pa.

T. W. Garve is now living at Brazil, Ind., 106 E. Compton St.

Marsden H. Hunt of the Western Electric Co., has moved from San Francisco to 62nd and Green Sts., Emeryville, Cal.

G. G. Kent formerly of the Detroit-Star Grinding Co., is now with the Square D Co., Peru, Ind.

H. J. Knollman of Philadelphia recently accepted a position with the Pacific Clay Products Co., at Los Angeles, Cal.

Chas. E. Kraus has changed his address to 110 W. 40th St., New York City.

R. B. Ladoo has resigned from the Bureau of Mines, Washington, D. C. and has an office with the newly formed Southern Minerals Corporation at 901 Continental Bldg., 14th and H Sts., N. W., Washington, D. C.

Percival Marson of Edinburgh, Scotland is now technical superintendant and chemist with Messrs. Sowerby's Ellison Glass Works, Ltd., Gateshead-on-Tyne, England.

G. Z. Minton is living at 1221 S. Anderson St., Elwood, Ind.

D. M. Moodie has removed from Norwood, N. Car., to 1225 Hamlet St., Columbus, Ohio.

Joseph K. Moore formerly of 120 Broadway, N. Y. City is now at 11 Broadway.

The Pacific Clay Products Company is located at 600 American Bank Bldg., 129 W. Second St., Los Angeles, Cal.

F. K. Pence has moved from East Liverpool, Ohio to Paducah, Ky., where he is located with the Paducah Tile and Pottery Co., as President.

Amos Potts is with the Franklin Brick and Tile Co., 8 East Long St., Columbus, Ohio.

Walter S. Primley, president of the Wisconsin Granite Co., has moved his office in Chicago, Ill. from W. Washington St., to 105 West Monroe St.

Louis E. Rodgers of the L. E. Rodgers Engineering Co., formerly of Chicago has moved to the Central Life Bldg., Ottawa, Ill.

John E. Sachs is living at 1221½ Main St., Evansville, Ind.

H. H. Sortwell who has been with the Bureau of Standards at Washington, D. C. is now with the Star Porcelain Co., Trenton, N. J.

Harry Spurrier has left the Square D. Co., at Peru, Ind., to accept a position with the Northwestern Terra Cotta Co., Chicago, Ill.

A. H. Stewart, formerly of Mellon Institute is now with the Phoenix Glass Co., at Monaca, Pa.

C. A. Underwood has changed his address to the General Refractories Co., 40 Rector St., New York City.

Jack H. Waggoner has moved from Topeka, Kans., to Charleston, W. Va., where he is located with the Libbey-Owens Sheet Glass Co.

Thomas C. Walker, Jr., is working for the Central of Georgia Railway at the Ceramic Experiment Station, Columbus, Ohio. Mr. Walker was formerly with the Matewan Tile Co., Matewan, N. J.

S. Paul Ward recently of the Shasta Zinc and Copper Co., Winthrop, Cal. is now with the Nevada Consolidated Copper Co., McGill, Nevada.

Word has been received that **Pittsburgh High Voltage Insulator Co.**, of Derry, Pa. has been changed to the **Westinghouse High Voltage Insulating Company.**

ELEVATION TO ACTIVE MEMBERSHIP

The Board of Trustees has acted favorably on the promotion from Associate to Active membership. These were nominated by the active members of the SOCIETY.

ASSOCIATES NOMINATED TO ACTIVE MEMBERSHIP

Edward Anderson, Supt., The A. A. Simonds Co., Dayton, Ohio
Cecil E. Bales, Louisville Fire Brick Wks., Highland Park, Ky.
Ralph F. Brenner, H. C. Fry Glass Co., Rochester, Pa.
Alfred E. Blake, 928 Union Arcade, Pittsburgh, Pa.
A. Lee Bennett, U. S. Bur. of Mines, Seattle, Washington
Lawrence H. Brown, Edwin M. Knowles Co., Newell, W. Va.
Dr. E. N. Bunting, 203 Ceramics Bldg., U. of I., Urbana, Ill.
John Clark, 292 Lockwood St., Astoria, N. Y., N. Y. Architectural Terra Cotta Co.
B. F. Drakenfeld, Jr., Treas., Drakenfeld Co., So. Murray St., New York
Frederic W. Donahoe, Secy., Refractory Mfgrs. Assoc., 840 Oliver Bldg., Pittsburgh, Pa.
Walter Geer, Jr., N. Y. Architectural Terra Cotta Co., 401 Vernon Ave., Long Island City, N. Y.
T. D. Hartshorn, U. S. Bur. of Standards, Kensington, Md.
James O. Handy, Pittsburgh Testing Lab., Box 1115, Pittsburgh, Pa.
H. S. Hower, Carnegie Institute of Tech., Pittsburgh, Pa.
R. F. Harrington, 388 Dorchester Ave., S. Boston, Mass., Hunt-Spiller Mfg. Corp.
R. F. Ferguson, Mellon Institute, Pittsburgh, Pa.
Herbert I. Insley, U. S. Bur. of Standards, Washington, D. C.
Paul S. MacMichael, Northern Clay Co., Auburn, Wash.
W. J. Rees, Lecturer and Head of Research Dept. in Refractories, Univ. of Sheffield, Ranmoor, Sheffield, England
Dr. S. R. Scholes, Federal Glass Co., Columbus, Ohio
Geo. E. Sladek, Beaver Falls Art Tile Co., Beaver Falls, Pa.
L. E. Saunders, Mgr. Research & Abrasive Plants, Norton Co., Worcester, Mass.
J. M. Stangl, Factory Mgr. Fulper Pottery Co., Flemington, N. J.
Gus M. Tucker, N. Y. Architectural Terra Cotta Co., 401 Vernon Ave., Long Island City, N. Y.
C. A. Underwood, Amer. Refractories Co., 120 Broadway, N. Y. City.
Dr. R. R. Shively, Chief Technologist, B. F. Drakenfeld & Co., New York

AMENDMENTS TO CONSTITUTION

All the amendments to the Constitution and By-Laws as published in advance in April *Bulletin*, page 86, received the necessary affirmative votes hence they are now operative.

For the nomination of Trustee Representatives of the Divisions it shall be necessary for each member who wishes to vote to declare which of the Divisions shall be known as his Major Division. A member can vote on Trustee representative only in that Division which he shall declare to be his Major. This declaration of Major Division membership will not affect one's membership in any of the other Divisions nor his vote on any question other than nomination of Trustee Representatives except as shall be described in the rules adopted by the Divisions themselves.

CONVENTIONS OF THE SOCIETY

Summer Meeting.—Details of the summer meeting in August have not been worked down to a definite program but this much is known. The Detroit Section with Frank H. Riddle leading is planning to give a royal welcome and a profitable time to those of the SOCIETY who will be their guests, August 8, 9, 10 and 11.

Glass and enamel products, spark plugs, grinding wheels, wall tile brick, indeed a large variety of ceramic plants and a large number of other industrial plants such as the automobile factories will be visited.

Most pleasant lake and river excursions are planned.

A more profitable week and excursion could not be planned than with fellow ceramists in the Detroit district.

The profit and pleasure is as much from the fellowship and broadened acquaintances as from the plants visited.

The 1924 Annual Convention.—Atlantic City, February 4, 5, 6, is the place and time.

The New Jersey Clay Workers' Association and Eastern Section of the AMERICAN CERAMIC SOCIETY of which Andrew Foltz is president, will be the hosts.

Hotel Traymore will be the headquarters.

Plans are already in the making for unusual plant trips on Thursday, Friday and Saturday of the Convention week.

CONTRIBUTION TO NEW CERAMIC SCHOOL

Mr. A. F. Greaves-Walker, President of the AMERICAN CERAMIC SOCIETY, has secured an important donation of equipment for the new school of Ceramics at the Georgia School of Technology, Atlanta, Ga. The contribution from the J. C. STEEL AND SONS CO., was secured by personal solicitation by Mr. Greaves-Walker and consists of one of their No. 3 Combined Brick and Tile Machines (20-30 M capacity) and a Hand Cutter for both brick and tile. The SOCIETY wishes to express its appreciation to this firm for their part in the organization of this new school of ceramic engineering.

OBITUARY

John J. Herold, late superintendent of the Ohio Pottery Company, died at his home in Zanesville on Wednesday, April 18. He had been in poor health for a number of years, and had not been active in business for several months.

Herold was born in 1871 in Carlsbad, Austria. He received his primary education locally and attended various art schools. He went through the usual period of apprenticeship and became a decorator on china and glass. As he was not in sympathy with the military domination of that time, he came to this country about twenty-eight years ago.

He worked in various glass factories in the East and came to Zanesville where he worked in the local art potteries, later becoming superintendent of the Roseville Pottery, a position which he held until 1908 when he went to Golden, Colorado on account of his health.

He built a small pottery, experimented with local clays and raw materials and developed and produced chemical porcelain ware, a product which is in considerable use in this country, but which before 1914 came from Germany, then the principal source of supply.

The Herold China Company was organized, and this company now operating as the Coors Porcelain Company practically enjoys the monopoly of the chemical porcelain industry in this country at the present time.

Herold was essentially a potter and not a business man. Consequently he was throughout his career more or less a victim of those who preferred to take advantage of his lack of business experience rather than capitalize on the full possibilities of his practical knowledge and at the same time give him a fair acknowledgment in return.

He left the Golden concern which he founded and organized and came to Cambridge, Ohio, where he produced chemical porcelain wares for the Guernsey Earthenware Company, and later was one of the founders and the superintendent of the Ohio Pottery Company where chemical porcelain, cooking wares and later porcelain dinner wares were produced.

Herold's work in Colorado was remarkable for the fact that he explored the mountains of the district for clays and raw materials, afterwards using these in his products. His first equipment was very primitive, and operated with little or no assistance except that of his brother-in-law who was not a potter.

He had little means, consequently his difficulties will be appreciated by those who know the conditions involved, especially when it is remembered that he was in poor health and not expected to live for a considerable period.

Besides his work on high temperature porcelain, Herold developed and produced a number of bodies and glazes of considerable industrial value. He was a sincere and earnest technical student and followed closely the German technical literature of the day. His main contribution to the Art Ware industry is possibly his development of the copper red glaze, a glaze better known to connoisseurs as the Chinese ox-blood or Rouge Flambe. This glaze, as its name implies, is a brilliant blood-red and can only be obtained by the reduction of copper, a process in the present state of ceramic practice involving a consumate knowledge of kiln operation and manipulation.

Herold was without doubt one of the greatest practical potters of the day. The fact that his activities were mainly concerned with industrial activities of ordinary size does not diminish the importance of his accomplishments in the minds of those who have closely followed his work.

It is to be regretted that he never had the opportunity of working with those who could either appreciate him to his full value, or who could adequately create conditions where he could work to the best of his ability.

For the purely personal side, he was both modest and unassuming so far as his accomplishments were concerned, but he possessed a commanding and forceful personality, characteristics which coupled with his knowledge and experience enabled him to direct the production of widely varying types of ceramic wares under most unfavor-

able conditions, and more often than not with the help of comparatively unskilled labor.

He was a fine, fearless and upright character and was loved by all who knew him. His passing is a great loss to the industry.

NOTES AND NEWS

DR. GEORGE K. BURGESS: NEW DIRECTOR OF THE BUREAU OF STANDARDS

The President has appointed Dr. George K. Burgess to the Directorship of the National Bureau of Standards. The appointment is a happy one, for Dr. Burgess is the outstanding member of the staff both with respect to his scientific attainments, his successful administration of the Division of Metallurgy, and the large and helpful contact which he has established with the industries. Dr. Burgess is of old New England stock. He was educated in the public schools of Newton, Massachusetts, the Massachusetts Institute of Technology, and the University of Paris. The latter institution conferred on him the degree of Doctor of Science, with highest mention. He was successively assistant in Harvard College Observatory, instructor in physics at the University of Michigan and at the University of California. In 1903, he was appointed Assistant Physicist in the Bureau of Standards. His work in pyrometry was notable and his published work on the laws of radiation and their application to high temperature measurements laid the scientific foundation for pyrometry as applied in American industry.

Dr. George K. Burgess.

In 1913, Dr. Burgess was made Chief of the Division of Metallurgy. His organization and program are models of scientific research organization. His published work includes some 75 titles and covers such important fields as railway materials, metals and metallurgy, high temperature measurements, general physics and science, and the organization of scientific and technical research. He has served as expert on many national and international commissions, and is an active member of the technical committees of numerous national societies. At the present time he is President of the American Society for Testing Materials.

VOLUNTARY ADOPTION OF STANDARDS OF QUALITY

By Julius H. Banner[1]

Among numerous topics of interest to the members of the Chamber of Commerce of the United States contained in the Annual Report of Secretary of Commerce Hoover for the year 1922, there is one to which I particularly desire to invite your attention. Under the heading "Voluntary Establishment of Grades and Qualities" Secretary Hoover has the following to say:

[1] President, U. S. Chamber of Commerce.

"Agitation has been current for many years for the extension of the Federal laws to the establishment of grades and qualities of different commodities. The lack of such established grades and standards of quality adds very largely to the cost of distribution because of the necessity of buying and selling upon sample or otherwise, and because of the risk of fraud and misrepresentation, and consequently the larger margins in trading. It was considered by the department, however, that it would be infinitely better if such grades and qualities could be established voluntarily in the trades themselves instead of by legislation, and policed by trade associations as is the case in several old established trades. To this end a number of conferences have been held in different branches of the lumber, textile, paper, and other trades. The service of the department has been to bring the different branches of the trade, the manufacturers, wholesalers, retailers, and representatives of larger consumers' associations together and to develop committees of different branches of trades. The plan has been generally welcomed and applications have been received from many trades for such assistance. The expert services of the Bureau of Standards, Bureau of Foreign and Domestic Commerce, and the other bureaus of the department have been brought into service for technical advice in these matters, and results of important bearing upon the improvement of business ethics and cheapening of distribution have been attained."

Voluntary Action Preferable to Legislation

This topic of voluntary action of business men to establish definite grades for various lines of merchandise should be of especial interest to the organization of the National Chamber. Shoe manufacturers, textile manufacturers, and others have been worried by snap-judgment proposals to set up so-called "pure shoe" and "pure fabric," etc., standards by government action. Of course, the reputable American business man is not afraid or unwilling to sell his goods on reasonably drawn specifications or to stand back of the quality of his product to a reasonable extent. There is nobody better qualified to pass on what is and what is not reasonable as a standard of quality or performance than those who are in the trade itself. Here, as Secretary Hoover points out, is undoubtedly a field for voluntary action on the part of producers, manufacturers, and merchants in establishing grades and setting standards of quality or performance, with which the consumers will be sympathetic.

Quality Standards Cut Down Commercial Disputes

Business is facilitated and the ground for commercial disputes between buyer and seller is narrowed down if sales are made on the basis of standard grades of merchandise, perfectly familiar to both buyer and seller. This is a phase of business of particular importance in international transactions, where different trade practices and different conditions exist. In a good many foreign countries there has been loss of good will for particular American dealers as well as some lingering prejudice to the good name of American business generally, which can be traced to the lack of understanding and agreement between buyer and seller as to the qualities entering into transactions, or to the absence of standards of quality and performance. When such standards exist, backed up by the moral force of a trade association or trade group in the United States, the promotion of the sale of American merchandise of a given kind and the building of good will toward American trade abroad are made easier, and rest upon a sound foundation.

Many Commodities Already Sold on Standard Qualities

There are a good many commodities sold extensively in the foreign trade for which quality standards commonly understood and accepted here and abroad are in effect,

either as a result of government action or as a result of voluntary action by the trade. The following commodities are exported largely on the basis of such quality standards: Grains—including wheat, oats, corn, barley, rye, rice, kafir, etc.; cotton, cottonseed products and other oil products and by-products; tobacco; coal; petroleum products; lumber; fertilizers; flour; meats and provisions; preserved and salt fish; fresh and dried fruits; canned goods; food specialties and drugs. In the year 1921 these commodities alone totaled in value about $2,700,000,000, or nearly two-thirds of the total export trade of the United States. In addition, copper and other metals, cement, various chemicals, iron and steel products, and a whole range of engineering material, and other commodities shipped abroad in considerable volume are sold on the basis of known specifications or known standards of quality and performance.

Important in Domestic as Well as Foreign Trade

I want to call this subject directly to the attention of the chambers of commerce, and the trade associations—especially the latter—in the membership of the National Chamber. Standardization, and the setting up of systems of inspection and certification in some cases, have made most progress among lines of raw material and food stuffs sold in bulk and moved in large amounts. The full possibilities of doing business on standards of quality have not yet been realized, even in many such lines of merchandise. It is, of course, not only in the foreign trade, but in the whole wide range of domestic trade that the use of clear standards, easily checked up, may be developed. The American Society for Testing Materials, and many other organizations represented in the American Engineering Standards Committee are making great progress in setting up and improving national standards on engineering products. The applicability of the same principles to numerous lines of manufactured specialties is well worthy of consideration by trade associations and chambers of commerce.

Opportunity for Action by Associations

In lines of merchandise where conditions warrant the adoption by representative trade associations of certain definite standards of quality or performance, the associations can hold to account any member failing to make delivery up to the standards adopted, and incorporated in sales contracts. Disputes arising in connection with such transactions readily lend themselves to settlement by the parties themselves, or by commercial arbitration.

Inspection Facilities

Some commercial and trade associations not only set up standards, but go further and provide rules and facilities for inspection and certification of merchandise. Costs must be kept down. With all due recognition of this fact, however, where actual inspection and certification of individual shipments do not add disproportionately to the costs of merchandise, and do serve a useful purpose, associations may well consider the possible desirability of making some arrangements, either with existing bureaus, laboratories, or other agencies doing commercial work of sampling, inspecting, testing, and certifying, or of actually setting up such accommodations if they do not exist adequately for the needs of the particular industries as those needs grow.

Coöperation by Government and Chamber

A good many association executives, and a good many manufacturers who at first have been skeptical of the possibility of setting standards in their particular lines, have gone to Washington and sat in with the members of the Federal Specifications Board,

and participated in the drafting of workable specifications for all federal government purchases in their lines. In the case of some commodities the federal specifications thus adopted are actually becoming used in private trade. The Bureau of Standards of the Department of Commerce has at all times shown a disposition to go as far as it can with the business men in working out technical specifications. There are laboratory and testing facilities here, provided by the tax payer, which may be availed of for this purpose. The director of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, has expressed the willingness of the chiefs of the commodity divisions in that Bureau to work with associations in this matter of standards of quality, particularly as they bear on the foreign trade. Our Department Managers in the different departments of the staff of the Chamber of Commerce of the United States are desirous of coöperating with any organization undertaking or extending this class of work.

NOTES FROM THE BUREAU OF STANDARDS

Service Tests of China Tableware

The Bureau of Standards has arranged for a series of service tests of hotel china at several prominent hotels. The tests have already been started at the Biltmore Hotel in New York and will be commenced at other places in the near future. Samples of the plates tested will be sent to the Bureau for laboratory examination, and large lots of the same ware will be put in service and examined from time to time in order to correlate the service given by the plates with the laboratory results.

Meeting of the Committee of the Federal Specifications Board on China and Glassware

The Federal Specifications Board's committee on china and glassware, at a meeting on March 26, adopted a list of sizes and shapes of chinaware and glassware which was accepted by all members of the committee. The resulting list shows a very considerable cut in the variety of sizes and shapes besides being definite and simple, and it will be used in obtaining bids. Drawings of all these articles have already been made and exhibited to all members of the Potters' Association so as to make certain that the articles adopted as standard are made by practically all manufacturers of this type of ware. It so happens that the potters are arranging a standard list of hotel ware in which only those articles are enumerated which are made by all potters for hotel and railroad service. The list adopted by the committee is similar to the list which the potters expect to adopt with very few exceptions.

A meeting will be held next month of potters, hotel buyers, representatives of the Pullman Company, and the Federal Specifications Board for the purpose of agreeing upon a final list.

Coefficient of Expansion of Glass Pots

The relation between the coefficient of expansion of the material from which the glass pots are made and that of the glass is an important matter, since it influences the cracking of either the pots or glass or both during cooling. During the month, the Bureau of Standards has measured the coefficient of expansion of three pieces of glass pot bodies, two being of the same composition but cooled in different ways while the third was of another composition. The values show a uniform increase from 0° to 700°C (the

limit of the test) of about 0.04 micron per cm. per degree Centigrade which is much less than the corresponding value for borosilicate glass, this value being 0.1 micron. Therefore, the only explanation for the tendency of borosilicate glass to break in pots, even with slow cooling, is that the relative strength of the glass is less than that of the pot.

ANNOUNCEMENT: THE NATIONAL TERRA COTTA SOCIETY

At the Annual Meeting of the National Terra Cotta Society at Atlantic City, N. J. April 21st, 1923, Mr. E. V. Eskesen, President of the New Jersey Terra Cotta Company, was elected President of the Society for the ensuing year. The remaining officers are: Mr. O. W. Ketcham, First Vice-President, Mr. Adolph Hottinger, Second Vice-President, Mr. Walter Geer, Jr., Treasurer and Mr. F. S. Laurence, Executive Secretary.

Mr. Eskesen was knighted by the King of Denmark April 30th, 1923, being decorated with the Order of Danebrog in recognition of his services in promoting the common interests of the Danish-American peoples, especially in the interchange of university scholarships, etc. between the two countries.

PRIZE FOR NEW IDEA

Members of the American Ceramic Society will be interested in noting the offer of a prize of $50.00 by the Vitreous Enameling Company of Cleveland for a *new idea* for an enameled product. Suggestions are to be sent to the Company on or before July 1, 1923, and the winner will later be announced in the pages of the *Bulletin*. Full details of this announcement are to be found among the advertisements of this issue of the *Journal*.

CALENDAR OF CONVENTIONS

AMERICAN CERAMIC SOCIETY (ANNUAL MEETING)—ATLANTIC CITY, FEB. 4, 5 AND 6, 1924.

AMERICAN CERAMIC SOCIETY (SUMMER MEETING)—TOLEDO, DETROIT AND VICINITY, AUGUST 8, 9, 10 AND 11, 1923.

American Chemical Society—Chemists' Club, N. Y. City, June 8.

American Dental Trade Association—Spring Lake, N. J., June.

American Electroplaters' Society—Providence, R. I., July 2–5.

American Face Brick Association—First Week in December.

American Face Brick Association (Southern Group)—West Baden, Ind., November.

American Gas Association—Atlantic City, Week of Oct. 15.

American Institute of Chemical Engineers—Wilmington, Del., June 20–23.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, June 25, 1923.

Clay Products Association—Chicago, Ill., Third Tuesday in each month.

Dental Manufacturers' Club of the U. S.—Spring Lake, N. J., June, 1923.

Fire Underwriters' Association of the Northwest—Chicago, Ill., October 17–18.

Manufacturing Chemists' Association—New York, June.

National Association of Window Glass Manufacturers—Place and date not determined.

National Exposition of Chemical Industries—New York, Sept. 17–22.

National Lime Association—Hotel Commodore, New York City, June 13–15.

National Symposium on Colloid Chemistry—University of Wisconsin, June 12–15.

Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.

Society for Steel Treatment (Eastern Section)—Bethlehem, Pa., June 14 and 15, 1923.

Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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A. R. Payne, A. E. Williams } Glass
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Vol. 2 July, 1923 No. 7

EDITORIALS

EDUCATIONAL TRAINING IN CERAMIC SCIENCE

Science is a general term covering both the fundamental and the applied knowledge of things and processes.

Collegiate education is a systematic training in the finding and marshalling of proven facts and theories in the solution of problems.

The acquiring of an education, the knowing how to find and use knowledge is a gift possessed by men in varying degrees. The simple minded or deficient person, cannot acquire much of an education; he has very little capacity for finding and using knowledge. To some, an education comes naturally; they observe and search for whatever knowledge pertains to the things in which they are interested. To others, education is not so natural. Ability to paint, sing, orate, spell or to be a mechanician, electrician or builder is a talent. Education is a talent which is developed by some people more easily and to a larger degree.

There is no artist, musician or mechanic who attains proficiency by any method other than systematic, diligent practice. Those who have the guidance of trained teachers acquire proficiency in their talents much more quickly, and their special talent is more broadly and thoroughly developed.

The retention of an acquired proficiency in a given talent also requires constant practice. Practice not only makes more perfect, but is abso-

lutely essential to sustained ability, whether it be as an artist, artisan or scientist.

There are specialists of many kinds in music, painting, crafts and writing. Talents of all sorts find their best development and expression in some special way or line. An inventor of electrical things would not, as a rule, have skill or ability to invent in other lines. A first class architect would, as a rule, do poorly as a sculptor, and a pianist would not do equally as well as a violinist. A few exceptional people have more than one talent highly developed, but these are the exceptions.

So it is in education. It would be idle for one to attempt acquisition of ability to find and apply knowledge in any other than the line in which he has a special talent. Bankers, merchants, preachers and lawyers are such by choice, but their choice was dictated in most cases by natural ability to serve in the vocation chosen.

Ceramic industries need specialists. They require the services of artists, salesmen, scientists, electricians, managers of men and financiers. Manufacturers of brick require the services of some artisans having talents and education in lines not required by the table ware manufacturers. The technical tasks for which graduates of ceramic schools are employed differ sufficiently in brick and pottery to require a different sort of view point and adaptability. The brick industry is more in need of a constructive engineer, and the pottery of a physical chemist, yet the technical man for each of these industries could well be prepared by the same sort of educational training. They could with profit have searched the same portion of the world's accumulation of knowledge (recorded facts) and could have had the same practice in analyzing and applying this knowledge to definite problems. These two men, each having had the same sort of educational training, will still possess a natural difference in adaptability to do industrial work because of their differences in points of view, interest and talents.

Since the view-points, interest and talents in the field of industrial ceramics are not developed in the young school fellow until after he has made a partial survey of the field it may be difficult to say what difference in preparatory training each should have for ceramic service. Rather than an instructor passing judgment on the pupil's adaptability, and rather than leaving it to the lad's blind choice as to what special training he should have, it may be better to give all the same course of rigid and thorough training in the searching and analyzing of knowledge for the solution of arbitrarily chosen practice problems.

The writer of this editorial does not believe in the one course of training for all, and yet he realizes the practical limits in variation of courses of training which any one school can offer. Elective or optional courses are not practical, for these do not give opportunity for the most beneficial

systematic development of the youth's educational possibilities; it risks too much to his unintelligent choice and whims, dictated as these are by social and other ambitions outside of his educational training in ceramics.

It did seem practical to the writer when he outlined the first courses in ceramic training at the University of Illinois to have two distinct courses—one engineering and the other science. The judgment then used was reversed by those who later had charge, but affirmed still later when others again instituted the two courses.

The problems of fabricating and burning are, to a large extent, the same in all clay working. If one can succeed as an engineer in a brick plant he ought to succeed equally well in a pottery as far as the engineering problems of flow of ware through the factory are concerned. One of the most original and successful china ware superintendents in this country spent several years making, installing and operating brick machinery prior to taking a short industrial course in ceramics at a college.

The glass and enamel industries wish their ceramists to deal with chemical and physical problems in the uniform production of high quality glass having certain properties, and to devise the furnace and its control in which the glass or enamel is produced.

In pottery, wall tile, floor tile and terra cotta there are similar physical and chemical problems in mixtures and colors and in the use of these in meeting trade demands. It requires more than mere maintenance of quality, reproduction of samples and technical control of plant operations. To serve in those ceramic industries where new effects, color combinations and new products are the essentials to continuing in business the ceramic chemist must be ever awake to development and promotion of new things. He must also either possess a constructional imagination and an artistic conception, or he must be closely allied and in close sympathy with men who possess these creative talents. The ceramic chemist must be more than a compounder of glazes, colors and bodies. He must conceive and know how to execute, as well as to provide the materials and mixtures.

The terra cotta industries are in need of ceramic chemists who can go along with architects in the conceiving of architectural effects. It is the task of the ceramic chemist who serves most fully in terra cotta to execute with the modeler and sculptor the conceptions of the architect and to be able to appreciate, understand and interpret the dreams of architectural artists.

The present day manufacturing conditions make it profitable, if not necessary, to be ready to diversify factory products. The wall tile and sanitary ware factories are now making bath-room fixtures in china. From the producing of these to the making of similar products for widely different purposes is natural. The grinding wheel factories are now producing refractory articles and non-slip tile. It pays ofttimes, from

an operating standpoint, to have a diversity of product. The necessity for a variety in art pottery is more generally understood but the same holds true in architectural tile and in decorative table ware.

No matter how well the ceramic chemist may be trained in the production of bodies, glazes and colors, and in the technical control of processes, he will be a failure and destined to assignment to routine tasks unless he is creative and unless he keeps abreast with the market possibilities. This requires that his interests, studies and activities shall extend beyond the laboratory, clay shop and kiln house. It requires that the ceramic chemist shall commune in person and through the literature and organized associations with those whose creative imaginations include the use of things which his factory can produce. It requires that he shall ever be familiar with all methods and processes for producing ceramic wares. He must know and have evaluating appreciation of both the fundamental and applied science researches that create information on ceramic materials, mixtures and processes.

There comes no time in one's active practice as a ceramic technologist when he can afford to cease searching the world's literature and communing with fellow ceramists. There comes no time when he can fail to know the best method of analyzing problems, and the source and use of materials. His educational training cannot be allowed a let-up. He must continue systematic searching by methods of his own devising.

One's fund of knowledge, cannot be greatly increased. While learning new facts, old ones are being forgotten. This is why the progressive and successful ceramist has his own card index of recorded knowledge, and why he values so highly the abstracting of the world's ceramic literature which appears in this *Journal* each month.

No matter what collegiate training and talent one may have had in the use of knowledge, he will make good only by keeping in contact with his fellows and by extending his activities beyond the factory and laboratory routine to the creative and promotional. One must have both the *incentive* and the *ability* to create; and this incentive does not often come to a recluse.

The educational training essential to the fullest success as a ceramic technologist is beyond the possibilities of college lecture halls and laboratories and can be acquired only by individual effort in collaboration with fellow ceramists and users of ceramic products. He who considers his course of training finished should be ready to retire by choice, for retire he will. It is that he may continue and broaden his educational training that the American Ceramic Society was founded and is continuing.

The success in service as a ceramist is more dependent upon the educational habits and system which one continues while employed than upon educational training received in school. This is made very evident by

many ceramists of ability, who either have had no special scholastic training or, at the best, have had only a brief collegiate course.

Collegiate training is of value, but of more value is the continued searching and applying of knowledge and the seeking of inspirations and opportunities outside of and beyond the limits of the routine tasks.

Two of the most effective ceramic educational institutions are the collegiate ceramic departments and the AMERICAN CERAMIC SOCIETY. There are other educational helps, but we submit that, given the self-insistence to improve one's education, the next in importance is participation in the affairs of the AMERICAN CERAMIC SOCIETY and that it is profitable for an employing concern to insist that its technical men and plant operators do so participate.

MESSAGE FROM PRESIDENT GREAVES-WALKER

During the month of June each of the ceramic schools sent out into the industry a number of young men who expect to make ceramics their life work. Most of these young men are now or will become members of the SOCIETY. To them let us, who have passed "through the fire," extend the hand of fellowship.

The SOCIETY, formed by a few enthusiastic technical men, has assumed the rôle of a "Big Brother" to the young technical men entering the industry. The first six months or a year often makes or breaks them in, so far as their career is concerned, and a helping hand, patience, and good advice will in most cases carry them over the rough ground onto the straight road of success.

To the graduates we extend the hand of welcome to our ranks with the hope that they attempt to give to the SOCIETY more, if possible, than they receive from it.

A new ceramic school looms on the horizon. The clayworkers of Georgia have determined to locate such a school at the Georgia School of Technology, better known as "Georgia Tech." Their efforts and determination are the more commendable in that they have decided that whether the State Legislature comes to their assistance or not they will themselves contribute sufficient funds to erect the necessary buildings and kilns out of their own pockets. The interest shown can be gaged by the fact that the *Atlanta Constitution*, one of the leading newspapers of the South, has offered to contribute $8000 to cover the operating expenses for the first year.

The American Ceramic Society congratulates the clayworkers of Georgia and the South and wishes them every success in this laudable undertaking.

May we again call the attention of the members to the Summer Meeting? Can we not have a record breaking attendance on the splendid trip on the Great Lakes? Make up your mind now to attend with your family, August 8, 9, 10 and 11.

Several very successful Section meetings have been held during the past two months. No better indication that the Society is alive can be found. The officers realize how much work on the part of a few men is required to make these meetings successful. We congratulate these men and bespeak for them the support of the Section members.

The idea adopted by several of the Sections of holding joint meetings with branches of other engineering or technical societies has proven very successful and is recommended to those Sections which have not as yet tried it.

PAPERS AND DISCUSSIONS

THE COLLEGE ART ASSOCIATION OF AMERICA

By Edwin M. Blake

ABSTRACT

The College Art Association, whose members are principally teachers of art in American Colleges, holds annual meetings for the reading and discussion of papers on the teaching of art, its history, and the principles of design. The twelfth annual meeting was held at the Museum of Fine Arts in Boston and at the Fogg Art Museum of Harvard University, April 6, 7, 1923. The Association publishes *The Art Bulletin*, issued quarterly, in which appear many of the papers presented at its meetings, beside other papers and reviews of books. References to some of the more important articles, including one on "Antique Glass," are given.

Were one asked to mention a few of the most important societies of national extent which minister to art education, he might well answer: The American Federation of Arts, The Eastern and Western Arts Associations, and The College Art Association of America. The American Federation through its large individual membership and by serving as a bond of union between the majority of the leading art societies of the country is able to make its influence cover a wide range. Its particular sphere of activity has been to extend the understanding and appreciation of art by the general public. To this end it publishes the *American Magazine of Art*, holds annual conventions, and circulates lectures and exhibitions. The Eastern and Western Arts Associations, whose large memberships consist of teachers of art and manual training in the grammar and high schools, are especially concerned with methods of teaching in those schools and the awakening of art interest in the younger students. The College Art Association has necessarily a smaller number of members who are principally teachers of art in the colleges, universities, and higher technical schools of the United States, and its interests chiefly fall under three headings: methods of instruction and contents of courses in art for the higher institutions of learning; history of art; and the technique and principles of design. The object of the present paper is to briefly describe those activities of the College Art Association which would seem to be of interest to the members of the Art Division of the American Ceramic Society.

It is the custom of the College Art Association to hold annual meetings at about Easter time, lasting two or three days, at which papers are read and discussed, local art collections visited, and social functions enjoyed. The twelfth annual meeting was held at the Museum of Fine Arts in Boston and at the Fogg Art Museum of Harvard University, April sixth and seventh, 1923. Other places of meeting during recent years have been New York, Cleveland, Washington, and Philadelphia. The Association publishes, *The Art Bulletin*, of which the first four numbers appeared annually, but beginning September, 1919 it has been issued quarterly.

Beginning with Volume V, September, 1922, the size has been increased from octavo to quarto permitting larger illustrations of objects of art. One of the undertakings of general interest carried through by the College Art Association is the publication of a list of "Books for the College Art Library" (*Art Bulletin*, Vol. III, 1920, pp. 3–60), a comprehensive bibliography of the fine and decorative arts, the result of several years' work by the committee in charge.

Under the heading "Art Education" may be mentioned the discussion on "What kind of technical art shall be taught to the A.B. student?" which took place at the sixth annual meeting at Cincinnati in 1917, and papers by Prof. Pope of Harvard University and Miss Kallen of the Boston Museum of Fine Arts on "The Teaching of Drawing and Design in the Secondary Schools" (*Bulletin* No. 3, 1917). In the fourth number of the *Bulletin* (1918) is a paper by the late Prof. Arthur W. Dow of Columbia University, "A Course in Fine Arts for Candidates for the Higher Degrees," and one on "Technical and General Education in the Arts" by Director E. R. Bossange of the Carnegie Institute. Other papers of note are "Schools, Colleges, and the Industrial Arts," by Richard F. Bach of the Metropolitan Museum of Art (*Bulletin*, Vol. II, 1920, pp. 171–175); and "A National Program of Industrial Art Education" by Charles A. Bennett (*Bulletin*, Vol. III, 1920, pp. 84–91). At the twelfth annual meeting of the Association a paper "Certain Thoughts upon the College Art Problem" was presented by Miss Alice V. V. Brown of Wellesley College, and one on "The Teaching of Drawing and Painting in the College" by Prof. Arthur Pope of Harvard University. If the members of the Art Division of the American Ceramic Society do not already know of these papers we would call attention to them, since they constitute a considerable body of expert opinion by many of the leading educators of the country in the art field.

On the subject of history, the College Art Association has had a number of valuable papers presented to it concerning drawings, paintings, and sculpture, which we need not stop to consider but pass on to one dealing with ceramics, an exceptionally important original study of "Antique Glass" by Gustavus A. Eisen (*Bulletin*, Vol. II, 1919, 87–119), which furnishes historical notes on the several periods of antiquity producing glass, a detailed and illustrated account of the technical steps employed in its manufacture, a key to the classification of antique decorated and mosaic glass, and a bibliography of the subject. Reviews of the following works on Greek vases have also been published: J. D. Beazley, "Attic Red-figured Vases in American Museums," Harvard University Press, 1918; J. C. Hoppin, "A Handbook of Attic Red-figured Vases, signed or attributed to various masters of the sixth and fifth centuries B.C.," two volumes, Harvard University Press, 1919; Mary A. B. Herford, "A Handbook of Greek Vase Painting," Longmans, Green & Co., 1919 (*Bulletin*,

Vol. II, pp. 42, 123, 178, respectively). At the twelfth annual meeting Prof. Homer E. Keyes of Boston urged the study of early American artistic crafts, specific mention being made of the glass industry and the beginnings of the potteries at Trenton.

Under the heading "technique and principles of design" may be mentioned a plea for "The Necessity of Developing the Scientific and Technical Bases of Art" by Edwin M. Blake (*Bulletin*, Vol. II, pp. 31–38), "Dynamic Symmetry—A Criticism" by the same author (*Bulletin*, Vol. III, pp. 107–127), "The Application of the Munsell Color System to the Graphic Arts" by Arthur S. Allen (*Bulletin*, Vol. III, pp. 158–161), and "Color Analysis as a Way to Develop Personal Choice in Color Grouping" by Clifford H. Riedell of Smith College. The last mentioned paper, presented at the twelfth annual meeting of the Association, was illustrated by a large number of diagrams in color. In connection with the paper of Prof. Pope, already mentioned, color studies by his students, following the system of Prof. Dennan W. Ross, were shown. Also Prof. Pope insisted on the value of a sound and liberal education to the artist, and in the matter of technical training for the painter pointed out the distinction between medieval times and our own. Formerly the artist was trained in an established workshop having well-defined methods based on traditions handed down from the past. Now those workshops have passed away and present day procedure must be based on rational study of the chemical, physical, and other factors involved. This is doubtless the best way, if carried out, but unfortunately much of modern painting shows both absence of ancient tradition and of any rational procedure to take its place.

Here should also be mentioned two other papers read at the twelfth annual meeting. "The Use of Autochrome Slides as Illustrations for Lectures" by Prof. Holmes Smith of Washington University, discussed the advantages and disadvantages of those slides and showed how truthfully they can render paintings in color. "Some Results of the First Year's Work in the Formation of the New Series of Photographs of Sculpture" by Prof. Clarence Kennedy of Smith College, makes report of an undertaking which has excited widespread interest on account of the splendid lifelike photographs of sculpture which he has produced. In the first place the piece of statuary is cleaned as completely as possible. Many ancient marbles carry various stains and incrustations which may, with care and labor, be removed without injury to the original surface. Then the piece is thoroughly examined by placing it in various positions and lights to determine which is the best to bring out its salient characteristics—trials which may take two or three days. Skilful photographing followed by painstaking development, printing, and mounting are necessary to the final excellent results. These details have been mentioned because it would seem there must be many pieces of artistic terra cotta, vases, and other objects of

ceramic art, both historic and modern, which might well be photographed, for purposes of instruction, by the careful methods of Prof. Kennedy.

While at Boston and Cambridge members of the Association were enabled to visit the Boston Museum of Fine Arts, The Fogg Art Museum and the Germanic Museum of Harvard University, the private collection of Mrs. John L. Gardner at Fenway Court, and the gallery of Mr. Desmond Fitzgerald in Brookline. Besides many masterpieces of painting, ancient sculpture and furniture in the Gardner Collection, there is a Roman pavement from the Villa Livia in the beautiful inner "Court" surrounded by the "Gothic Cloisters," two pieces of terra cotta by the della Robbias, and several quaint tile floors by Henry Mercer of Doylestown, Pennsylvania. Mr. Fitzgerald has a noteworthy collection of French paintings, a great number of water colors by Dodge Macknight, some interesting ancient Chinese porcelains, and a remarkable collection of Corean pottery of the Korai Period, dull gray green in color with white underglaze decorations.

Brooklyn, N. Y.

IMPORTANCE OF PURE RESEARCH ON GLASS IN AMERICAN UNIVERSITIES

By Alexander Silverman

ABSTRACT

A discussion of the importance of a systematic study of the properties and reactions of chemical substances utilized in glass manufacture. A long list of problems in pure research is given, most of which would directly benefit industry through their practical application. The organization of a glass manufacturers' association for the purpose of subsidizing this research in colleges and universities is recommended. The value of research to corporations and other associations is indicated.

One of our largest manufacturers of electrical machinery maintains a research laboratory which has cost millions of dollars. As a result, metals and alloys, insulating materials, etc., have been studied for their specific properties, and these have been listed and cross-indexed so that any department in the factory may look up a material of certain properties and utilize it without delay. This research department must pay, or the company would not continue to employ high-salaried investigators and spend such vast sums on the researches. It is a well-known fact that two German dye manufacturers employed over one thousand chemists before the war, many of them Ph.D.'s. Although only five per cent of the problems undertaken were successful, the companies were able to pay over twenty per cent per annum to their stockholders. The industries cited are unquestionably better able to spend considerable sums for the maintenance of research laboratories than any of our glass manufacturers, except a few of the larger corporations. The glass industry as a whole, would, however,

derive appreciable benefit, if each company through a "Glass Manufacturers' Association," contributed a moderate sum towards the maintenance of pure and applied research. This has already been attempted by manufacturers of refractories, paper, paint and other materials, and the fruitful results have added to the profits of many of the members of such associations. In some instances, individual companies, still retaining membership in the association, have installed private research laboratories at their plants.

Costly instruments of precision are required for careful investigation. These are found in the laboratories of chemistry and physics in our colleges and universities. Other equipment, such as melting furnaces, is generally lacking. Thousands of students enroll annually for study towards the advanced degrees, Master of Science and Doctor of Philosophy. Many of the professors of chemistry and physics are men of long experience and mature judgment. The salaries required to employ these men would prove prohibitive in most of our glass plants. A "Glass Manufacturers' Association" receiving nominal contributions from a large number of members could arrange to endow fellowships at $1000 each in several of the best universities, and by defraying the cost of installation of furnaces and accessory devices, promote pure research on glass which would prove of incalculable value to the industry as a whole. Professors in charge of science departments will carefully choose men to handle these problems and the men, in turn, will naturally take an interest in the field for which they prepared, so that glass manufacturers who want to employ them later, may secure the technical service of scientists, well trained in the fundamentals of glass science, and receptive to practical plant training, operation and control work. Today, when the manufacturer wants a chemist or physicist who has some knowledge of the glass field, our educational institutions must of necessity say "we haven't one." State appropriations and private endowment funds hardly suffice to meet the universities' needs in training students in the ordinary fundamentals, to say nothing of specialized training.

Would it prove of interest and value to your company to know that you could substitute this material for that one and lower the cost of manufacture while still maintaining the quality of the ware? Would you substitute another material to improve the quality of the glass at the same cost or even at a slight advance? Would you eliminate stones, cords, striae, blisters and seeds if you could? Does the color of your glass change at times, though you have not changed the quantity of coloring or decolorizing agent? Wouldn't you like to know how much of this or that material is lost in melting the batch? Would full economy in the operation of your plant seem desirable? Wouldn't you change your batch to prolong the life of pots or tanks? Does the size of your cullet pile worry you? Would you learn how

to reduce it? You may think that these are plant problems, but in reality they are pure research problems as well, and the fundamental principles on which their solution depends are applied "every day, in many ways" in the graduate departments of our universities, ultimately proving of value to industry.

Forty of the eighty-eight known chemical elements have been used (either free or in their compounds) for glass making. Many of the others may never have utility in the field. Some undoubtedly will. But what of the forty? Do we know all about their application or that of their compounds? Hardly. Let us stop to enumerate a few of the things we do not know.

What portion of the original sodium carbonate is lost in melting an ordinary soda-lime batch? How much more, if any, is lost when we melt the batch with cullet? How do variations in lime or silica content of the batch influence the alkali loss? How do variations in furnace temperature affect it? How does the loss in pots, compare with that in crucibles or tanks? How does the melting rate or size of container influence loss? What influence do various quantities of alkali have on the container during the melt? What effect do they have on the finished product as to durability, permanence of bright surface and influence on contents of bottles, for example? We have very little definite information, yet soda ash has long been used in glass making, probably over 3000 years, if we include the natural soda employed in Egypt.

Some manufacturers employ limestone, which may be almost pure calcium carbonate, or contain magnesium carbonate up to forty-two per cent. What are the effects of variation in magnesium carbonate between these limits, on the glass? Is the same furnace temperature and duration of melt desirable? Does magnesia embrittle the glass and promote devitrification though it lowers the coefficient of expansion? Can anything be introduced into the batch to offset the undesirable properties produced in glass, so we may still use it and obtain desirable effects? Would it be better or worse practice for uniformity and economy to use burnt (quick) lime, or slaked (hydrated) lime, instead of limestone? Lime and limestone also have a long history in the glass industry, and we may know more about them than we do concerning most other materials, but much is still unknown that pure research would bring to light.

Sand is surely a common material. How do grain size and shape, beside composition, affect melting conditions? At which furnace temperature will the sand dissolve soonest? How does the fluidity of the flux govern this rate? Should we use equivalent amounts of various alkali compounds or substitute so as to retain the same viscosity in the flux? Should the viscosity be controlled by varying the amount of alkali, or by adding another chemical to retain desired alkali equivalent and still get proper fluidity?

What are the limits for sand, soda and lime in soda-lime glasses at various temperatures? The last question and a few similar ones have been partially answered through pure research.

How do common impurities affect glass? Is the alumina from sand and other raw materials and that dissolved from pot or tank walls beneficial or objectionable? If beneficial, would the introduction of alumina into the batch lower attack on refractories and prolong their life? Alumina permits of a higher lime content in glass. Does this improve the glass and what are the exact relations between the lime and alumina?

Is there any advantage in using red lead instead of litharge? How much niter is necessary in lead batches to prevent reduction? Can this be figured from the batch, or must the furnace gases be taken into account? Does the oxidation by niter continue long enough during the melt to do what tradition claims for it? Is lead reduced by the repeated introduction of the hot baits of blow-pipes? Can we find substitutes for pearl ash to insure resonance in fine flint table ware? Cannot resonance be estimated like refractive index and expansion coefficients?

Are certain chemicals compatible in the batch? Should lead and sulphur compounds appear together? Will selenium work in lead batches? What are the relative effects of coloring agents on soda-lime batches, lead-potash batches and other combinations used in making colorless glass? Is arsenious oxide an oxidizing or reducing agent in glass? How does it affect the color produced by iron compounds at various temperatures?

What are the proportions of aluminum and fluorine in compounds which will produce certain densities of color in batches of various types? How does the addition of zinc compounds, of boron compounds, of sulphates, of chlorides, influence the color? Are best results obtained in open or closed melting units? Why do glasses containing the same quantity of aluminum and fluorine strike when certain chemicals are employed in the batch and not when others are present? How is the composition of the glass related to dispersive power and light transmission?

How are annealing temperature and period to vary according to composition? How do annealing conditions affect color, glass surface, subsequent behavior in storage, etc.?

Selenium produces a red color in zinc-potash glasses in the presence of cadmium sulphide, arsenious or antimonious oxide and a reducing agent. How does the color compare with that obtainable in soda-lime, potash-lime, zinc-soda, and lead glasses? What are the best proportions for the coloring agents? Can alumina replace zinc? May other sulphides be substituted for cadmium sulphide? Will other cadmium compounds answer as well as the sulphide? Are selenium compounds better than the element? How do selenium reds compare with the colors produced by the related elements, sulphur and tellurium? Do fluorides affect the color? Is reheating neces-

sary to bring out the red? If not, how can it be eliminated? What influence does the reheating temperature and period have on color? Is the glass uniform in color, or are the edges yellow? How can the color be made uniform?

If we have so many problems to solve in the above given partial list of substances containing the few elements mentioned, one may readily imagine how this list can be extended by covering others and adding new elements and their compounds. America is held in renown for her wonderful development of the mechanical aspects of manufacture. She has forged on in scientific progress also. The investment of a little money in pure research in our colleges and universities to supplement that now conducted by the United States Bureau of Standards and the Geophysical Laboratory, would not only materially help our glass industry, but serve to place America in the lead in scientific research on glass. The published researches and work now in progress in the University of Sheffield, England, should serve as an admirable example.

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COLLOQUIUM ON FELDSPAR SPECIFICATIONS

Problems Involved in Writing Specifications for Feldspar[1]

By Edward Schramm

The work which the American Ceramic Society is about to undertake in developing specifications for ceramic materials calls to mind the analogous efforts in a wider field of the American Society for Testing Materials. Indeed, writing specifications constitutes the chief activity of the latter Society and we may learn a number of things from their experience and procedure. The first and most important is to go slow. The Committees having these matters in charge report proposed specifications to the appropriate division of the Society; these are first adopted and published as tentative and only approved as final after lapse of a considerable period of time and subjection to searching criticism. We could not do better than follow this procedure. If our Society is to make a serious effort to write specifications, it will be necessary for some of the members, presumably the Committee on Standards, to devote some hard study to the project. A symposium, such as we are holding, cannot be more than an introduction.

[1] See Howard C. Arnold, "The Polarizing Microscope as an Aid to Feldspar Standardization," *Jour. Amer. Ceram. Soc.*, **6** [2], 409 (1923); F. C. Flint, "Feldspar for Glassmakers," *ibid.*, p. 413; M. C. Booze and A. A. Klein, "A Rapid Means for the Determination of Quartz Content," *ibid.*, **6** [6], 698 (1923); "Feldspar Colloquiums," *Bull. Amer. Ceram. Soc.*, **5** [7], 78–101 (1922); **5** [8], 133–47 (1922); **5** [11], 269–95 (1922); "Proposed Tentative Feldspar Specifications," *ibid.*, **6** [6], 163 (1923).

Standard specifications are fully as useful to the producer as to the consumer since they tend to replace a multitude of individual specifications and reduce needless diversity of demand. The specifications cannot entirely take care of the question of *quality* since there are usually matters involved beyond their scope. Thus two foundries may produce gray iron castings which answer the chemical and physical requirements of a certain specification but superior technique in manufacture may render one product far better than the other.

Most specifications deal with manufactured products which are more or less under control. In the case of feldspar we must take the rock as nature provides it, modified of course by selection at the quarry and mill. We cannot, therefore, truly "specify" at all but can only choose what we want out of nature's storehouse. The basic study is, therefore, to find out what that storehouse contains. Every useful feldspar mineral should have a place in our scheme.

It is apparent that we are faced with the larger task of classifying the feldspars according to their ceramic properties. These properties, the most important of which is the fusion point, are determined in the main by chemical composition and degree of grinding. However, there may be other factors involved, such as variations in crystal form and the following question may well be raised: given two feldspars of nearly identical composition, can it be assumed that they will behave the same on firing? We know that of the high potash feldspars some are classed as soft and some as hard. In an abstract of a paper by M. E. Denaeyer,[1] we read that "the analysis of two microclines (triclinic potash-soda feldspars) is considered to indicate that they are built up of three separate components in solid solution." From the same source,[2] according to Gossner, "attempts to deduce from the chemical composition of a crystal the constitution of the corresponding molecular unit are fallacious. . . . By postulating the existence of a limited number of simple stable silicates as molecular individuals, the structure of more complicated silicates can be explained as due to combinations of these."

Leaving the somewhat speculative subject of the true molecular composition of the feldspars and its influence on their properties, we shall have to deal chiefly with chemical composition, grinding standards, and fusion point. It will probably prove best to restrict the chemical requirements to the alkali content, establishing different ranges for the several grades. Perhaps more important than the actual composition is the question of constancy; what variation is permissible from an agreed standard of composition? The methods of chemical analysis of feldspar are somewhat tedious but well established and reliable. We are fortunate in having on our pro-

[1] *Ceram. Abs.*, **2** [2], 12 (1923)

[2] *Ibid.*, p. 13.

gram two papers dealing with the application of petrographic methods to the problem. These are obviously quicker but it is a question whether they are sufficiently exact for the purpose.

Passing from the question of composition to that of grinding, we are on much surer ground. Probably the millers will be glad to do as much or as little grinding as they are paid for and it should not be difficult to establish several grades to meet the varying demand. The method of testing must also be agreed upon. The writer believes that washing through a screen of 250-mesh or finer is the most practicable procedure. The coarser screens do not adequately distinguish between poorly ground and well ground materials.

As a supplement to the chemical composition and grinding standards we may include a fusion test under carefully regulated conditions. This test is especially useful where the consumer is drawing on one source of supply as it gives a simple means of detecting sudden changes. It is questionable whether we have the data needed to correlate this test with chemical composition for the different feldspars.

In the foregoing brief survey, the writer has attempted to state the problem and it is hoped that the papers and discussion to follow will lead us nearer to a solution.

Proposed Tentative Feldspar Specifications[1]

Since the last Annual Meeting the Committee has been in correspondence with several producers and large consumers of feldspar.

The consumers are a unit as regards specifying the characteristics of the feldspar they purchase. As might be expected the producers see many difficulties in the way. However great and real these difficulties are, they must be surmounted to the end that the industries which give to feldspar its value may enjoy a greater measure of freedom from uncertainty and consequent loss.

In the September, 1920, *Journal*, "Specifications for Commercial Feldspar and Flint," by A. S. Watts, was published. His noteworthy contributions have assisted all, particularly the thorough work published as *Bulletin* **53,** of the Bureau of Mines, 1913, on the "Mining and Treatment of Feldspar and Kaolin."

It has become the practice of certain manufacturers to use more than one kind of feldspar ground to various degrees of fineness. Feldspar millers are now grinding finer than was the common practice even two years ago. In this connection a series of valuable suggestions has been received from G. E. Sladek calling attention to the fact that, at the present time, feldspars of definitely different composition and definitely different grinding characteristics are in use.

[1] *Bull. Amer. Ceram. Soc.*, **6** [6], 163 (1923).

In view of the above it is suggested that Prof. Watts' specifications be amended as shown in the Feldspar Specifications.[1]

Discussion

SECRETARY TREISCHEL:—The first point is in regard to the sampling of the material.

1. **The Sample.**—In sampling car-load lots, equal amounts should be taken from at least five different points in the car, no two samples being taken within five feet of each other. In sampling from a bin, five separate samples shall be taken from different portions of the bin and not more than two from the same level. The total sample shall not be less than ten pounds.

A MEMBER:—Does it specify the weight of sample?

C. C. TREISCHEL:—Not less than ten pounds. Two pounds from each place.

F. S. HUNT:—Would that prevent the use of an automatic sampler?

A. S. WATTS:—The proposed specification provides for sampling from at least five different points. Where an automatic sampler is used 40 samples can be taken as easily as five. But where there is no automatic sampler it is very simple to get five samples from a carload.

F. S. HUNT:—At least five samples?

C. C. TREISCHEL:—Yes.

F. C. FLINT:—What type of automatic sampler is used?

T. A. KLINEFELTER:—A simple way is to take a brass tube about two feet long, two inches in diameter and put a device on the end so that it permits the tube to fill as it is pushed down, and closes as the tube is withdrawn.

C. C. TREISCHEL:—It is proposed in this specification to have four grades or classifications according to their chemical composition: Grade A with potash content above 10%, and soda content below 3.6%, and total lime and magnesia content below 0.75%; Grade B with potash content above 9%, and soda content below 3.2%, and lime-magnesia content not above 1%; Grade C with potash content above 7.8%, soda content below 2.8%, and a lime-magnesia content not above 1%; Grade D with a potash content not above 3%, a soda content not below 7%, and lime-magnesia content not above 1%; Grade D is to cover the soda feldspars.

R. B. LADOO:—Might I suggest that that gradation does not cover a type of feldspar sometimes met, where the potash and the soda are more or less equal? There should be some combined classification which would show total alkali content so as to take care of these mixed feldspars; for example, one with 5% potash and 5% soda, which is possible. This specification would not cover that at all.

J. M. MANOR:—The feldspar used in the glazes, though it has the higher soda content, is the higher-priced feldspar; necessarily so on account of its alkali proportion.

[1] *Op. cit.*

J. P. Rodgers:—The point brought out by Mr. Ladoo is one that ought to have careful consideration. In the short reading I have had of these Specifications it has occurred to me you are treading on your own toes. Of course, as far as we feldspar men are concerned, we can only sell what the potters want and if we have nothing in accordance with their specifications we cannot sell it. But, as Mr. Ladoo says, there is a considerable amount of feldspar on the market not covered in any of these. I believe that 25% of the manufacturing potters are using a feldspar more nearly $8^1/_2$ potash and 4 soda.

When you try to fix the proportion of alkalis you are getting into deep water. I have seldom met with two potters who agree what that proportion should be, hence I really think you had better leave the selection of proportionate contents of alkalis to the individual potter.

For instance, possibly a year ago, I had to make a pilgrimage to the eastern shrine of pottery. I went there not to sell but to get their viewpoints. One man (well-known in the American Ceramic Society) asked me if I had anything new in the feldspar line. I said, "No." Then he said, "Why come here?" I said I came to see if he held the same views as to the composition of feldspar as he formerly did. He said, "I do, and I will say to you that the man who buys feldspar containing 1% of soda is a fool. The man who buys it containing 3% is a fool of a greater degree.

This potter is a very able fellow, yet that is his opinion. To another potter (to whom I do not sell feldspar) I said, "How does this feldspar you are using analyze?" He said that he never asked me for the analysis of my feldspar when purchasing from me and that he had not asked this man. He did not care what it analyzed.

This latter fellow is a successful manufacturer of hotel china, to whom I sold feldspar for twelve years. In those twelve years I got into trouble with him five or six times. Every time it was because the exigencies of the crude feldspar market forced me to change my mix from the usual $8^1/_2$ potash and 4 soda. That fellow was only one of a very considerable number using something approximating that mix.

I think the key to the situation is entirely missed when feldspars are grouped or classified on the basis of character of alkalis. If it is fixed on the maximum silica content of the feldspar there is a long step taken toward the solution of feldspar problems.

B. E. Salisbury:—It would be a fine thing if feldspar could be produced strictly according to specifications, but most potters would like to know what they are getting when they get a carload of feldspar. If some way could be found under which a producer of feldspar would guarantee that his feldspar would answer a certain analysis which he published, with permissible variation in the various ingredients, we shall have gone a long way in advance of anything we have had before. Then it is up to

the individual potter, to select what he needs. He would have the assurance that he would get the same feldspar as long as he got it from one source. The feldspar producers should be able and willing to do a practical thing like that. We cannot hold them down to points impossible for them to reach. There are natural physical limitations which control the product of each feldspar producer. But if we know what we are buying, we could take what we want (at least, that is the way we feel in our company).

CHAIRMAN PENCE:—Following that suggestion of Mr. Salisbury's I take it, that, if the producer gives us an analysis of his feldspar, guaranteeing that it shall not vary beyond specified limits, we should be satisfied.

B. E. SALISBURY:—That would be my idea.

J. M. MANOR:—We could go further: Exact from the producer a statement as to just where his feldspar comes from, the particular mine, and also that when conditions vary he shall not without due notice substitute a different feldspar. I have heard this talk about changes in a given feldspar. As a general proposition, these changes are not made, but if a mine is exhausted of one kind and the producer decides that another mine runs about the same, trouble will probably follow if he attempts to slide that in.

C. M. FRANZHEIM:—Can you tell me on what basis these varying alkali bases are to be fixed? Is it on the basis of the way it occurs or on the pottery requirements?

CHAIRMAN PENCE:—I think it was indicated in the opening remarks that these analyses are attempts to classify. It is really identification rather than grading according to quality. However, Mr. Salisbury has indicated that we could avoid confusion by simply asking for the analysis and specifying that it should not vary beyond certain limits. The consumer would then select what he wants.

C. M. FRANZHEIM:—Has any attention been paid as to whether these proportions really exist?

H. SPURRIER:—Yes, you will find these quantities correspond to the feldspar on the market.

A classification rather than specification is what is wanted. I am glad to see the weaknesses brought out. We need something that will cover the quantitative relation between potash and soda.

C. M. FRANZHEIM:—I find a great weakness in these proposed specifications. There is no alumina content. The value of a feldspar is not in its potash content but its relation of content of alumina to that of potash and soda. One customer told me he bought feldspar only for the high potash. He overlooked the fact that the alumina content had some bearing. I see no mention of that. There is great value in the relation of the potash and alumina which should be considered.

F. S. HUNT:—Regarding the alkali percentages: A fifth class to include those feldspars which come between Class D and Class C could be provided,

called Class E, and include all feldspars in which the relation of the soda and potash is between those two limits. That would include all feldspars regardless of the relation between the soda and potash.

CHAIRMAN PENCE:—These specifications are in process or in progress. We do not expect any answer today. The Standards Committee will benefit by the expression of your opinions and knowledge. They will then do further work on the Specifications.

C. M. FRANZHEIM:—I should like to see the Committee investigate the relation of the alumina content with regard to the potash content.

H. SPURRIER:—The alumina content is automatically controlled. Normally speaking, the existence of the alkali controls the alumina.

C. M. FRANZHEIM:—I have seen feldspar with $8^1/_2$ potash that was softer than another having 14% potash, because the alumina content was low. The value of feldspar is therefore not determined alone by its potash content but the proportions between the content of alkalis and the content of alumina.

T. A. KLINEFELTER:—I have made the same observation as Mr. Franzheim relates but in this the soda content was higher. I thought it was of the proportion of the soda to the potash feldspar which made a eutectic. I believe with Mr. Spurrier that the potash content largely controls the alumina content and this softness depends on the proportion of soda to potash. It has been my experience that the total alkali could be low if the soda content is somewhat high.

C. M. FRANZHEIM:—A feldspar low in soda, high in silica, about 70 or 72%, and low in alumina will be a softer feldspar, visibly softer than the feldspar of 13% of potash and high in alumina. It is the relation of these various things to each other that has a big bearing on the value of the feldspar. The high potash feldspar does not necessarily belong in Grade A.

According to these proposed specifications for grading, in the minds of my clients, I would be selling Grade B feldspar, a suggestive situation which I wish to avoid. It is because of the psychology involved in any classification of this sort that I would avoid selling B feldspar. I believe my feldspar is Grade A, commercially speaking. I am speaking from a commercial standpoint and of the impression a classification of my feldspar as "B" would have in the minds of my customers. I do not want a classification and have my customer ask me, "What grade are you selling?" and have to say, "Grade B." He would say, "You are asking high prices for Grade B."

If the trade would understand the purpose of this classification it would be all right, but most of the buyers neither could nor would.

C. C. TREISCHEL:—How would you prevent that psychological idea on the part of the consumer.

C. M. FRANZHEIM:—Grade A would be the best, and B would be second grade. We, here, would understand it differently but to a purchasing

agent and also to many practical plant men Grade B would stand for an inferior product. I am thoroughly in favor of this classification from the viewpoint on which it was drawn but to the consumers Grade A (10% and above potash) would mean that this was the most valuable feldspar whereas I think you would find that it is not in all cases. High potash does not mean greater value.

C. C. TREISCHEL:—That is quite true, but what we need is some assistance for the Standards Committee to work on.

C. M. FRANZHEIM:—That is a hard problem. I should like to see the Standardization Committee, before they adopt anything, visit the various mines and see their problems. They could see what we are up against every day. I am sure they would be welcomed, and they could work with the men who select the feldspar.

B. E. SALISBURY:—I appreciate the psychological effect of this grading. Why not call the best feldspar Grade D?

F. S. HUNT:—Instead of class names, use the same system which the pencil manufacturers use. Classify the high potash feldspar as "K," high soda as "N," your medium grade as "KN," your second grade of potash as "KK," or something of that nature. That would relieve the situation altogether.

A. S. WATTS:—I should like to point out that if a feldspar contains 9% of potash, and $3^1/_2$ of soda, there is $12^1/_2$% of alkali. That feldspar is not going to run over 17% of alumina, is it? Have you seen any running over 18 or 19 with the potash between 9 and 10 and the soda less than $3^1/_2$%?

C. M. FRANZHEIM:—It will not go over 18.

A. S. WATTS:—If the total alkali and alkaline earth is not over 14% and the alumina is not over 18%, there must be 68% of silica. We know that a moderate amount of excess silica makes a softer feldspar, *i. e.*, feldspar that will fuse at a lower temperature.

We buy feldspar for its flux value. If I have a pure feldspar unmixed with flint or quartz with 14% alkali in the ratio of 10 and 4, I can introduce silica as flint bought at a very much lower price than that of feldspar, hence lower than if incorporated with the feldspar. On this basis the high alkali feldspars would properly be of higher value. This, however, is not the solution of the problem we have here.

I do not think the question is how much alkali or soda or alumina they shall contain as it is to find out what we are going to establish as a standard. The consumer as a rule has his own definite idea of what is meant by a No. 1 and No. 2 feldspar. He evidently thinks a No. 1 feldspar is a more or less definite article. I realize that the producer is going to object to classifying his feldspar if it puts it into a class that appears low. That is normal and fair. I believe, however, that the scheme of classifications here proposed is logical. It does not mean you will sell by it. It simply means that when

you say your feldspar is in a certain grade the man buying it has a general idea of its analysis, that is, this classification gives an interpretation to the analysis placing the feldspars into groups having a definite limit of permissible variations in composition. It seems to me that a fair classification can be based on reasonable limits of compositions.

I believe, also, that a classification based on the fluxing value of a feldspar can be established. As we know, the standard cone is constant within very small limits, and if a classification is based on the cone temperature at which the feldspar will fuse by itself and will fuse when mixed with 10 or 20% of added flint, I believe the feldspar producer and consumer both would have valuable information. And it is easily obtained. You do not need a week to make the fusion test of feldspar.

One word about the potash-soda content. There are two feldspar producers present who are prepared to furnish a feldspar with 8% of potash and 4 or 4½% of soda. One of these feldspars is standard. Is this a blended feldspar?

J. P. Rodgers:—It is a natural blend.

A. S. Watts:—It seems to me we must make a distinction between mill blended feldspar and a natural blended feldspar. A blended feldspar will vary in ratio from 5% of potash and 7% of soda to 7% of potash and 5% soda. We should differentiate between natural potash feldspars in which a small amount of soda is naturally present reducing the potash in the rock, and the mixture which is made up of a potash and soda feldspars intimately associated. I think we ought to call that a blended feldspar or by some other name to differentiate from the perthite in which potash feldspar is replaced in rock by soda feldspar in small amounts.

Secretary Treischel:—The next points were "Physical Properties and Test:"

1. Color and Specking:

Bearing in mind the variety of wares in which feldspar is used and the various standards as to color and specking potters find it necessary to establish, it is considered desirable to leave this matter open to agreement between vendor and vendee.

In other words, if a buyer gets up a set of specifications and bases his specifications on this classification, he can put in almost anything he wants.

2a. Fineness of Grain:

One hundred grams of the sample, after being dried to constant weight at 105°C shall be tested for fineness of grain according to the process set forth in paragraph 2b and the residues on the various sieves shall not exceed the maxima as set forth in the following table:

Screen No.	100	140	200	270	325	Total residue
Grade 1	0.25	0.5	1.25	2.0	5.0	9%
Grade 2	0.50	1.0	2.5	4.0	6.0	14%
Grade 3	0.75	1.25	3.75	5.0	8.0	18.75%

For the screen analysis the Standard Screen Scale sieves are used, the openings increasing in the ratio of the fourth root of 2 or 1.189, as recommended in *Year Book*.[1] All percentages are on the dry basis.

Is there any discussion on the fineness of grain as to those grades? In making up a specification from a classification like this you could have grade "K," and according to fineness, "K-1;" or grade "K," according to fineness, "K-3," which would be a little different. A thing of this sort is very flexible.

R. B. LADOO:—I notice that you specify residues on many different screens. That would be almost impossible to approximate in practice because the residues on various screens depend not only on the physical characteristics of the feldspar but upon the method of screening. If you specify residues on five different screens it is much like trying to draw a circle between five different points. You cannot do it. You should specify a limiting screen. For example it might be specified that all should go through 80-mesh (limiting screen) and 98½% should go through 200-mesh. With these limits set, the residues on other screens will be automatically regulated by the method of grinding and the physical properties of the feldspar.

C. C. TREISCHEL:—That point seems to me to be well taken. I have found that same variation in material coming from continuous grinding and from batch grinding.

H. SPURRIER:—These are supposed to be maximum figures. You could hardly expect a hard and fast specification. It was expected a good deal would be altered. These quantities come within the limit of my own experience as far as that goes. It was impossible for me to go specifically outside of that. My experience is not wide enough. I want it corrected, amended or rejected. Whichever you do, it is open to objection. It is desirable to have intermediate sizes and to know about them and if you only cite limiting points you are escaping or missing something that is very useful. At the same time I agree you are trying to draw a circle in the five points. Whichever you do you have to draw our circle inside the five points.

P. H. BATES:—It is a matter of carrying the specifications into effect. Screens will differ. Take some with the Bureau of Standards certificate and they will give you half a dozen different results. With the same sample on the 200-mesh screens there was a difference of 5%. That is a difference in the operators. The A.S.T.M., which are the standard, allow a tolerance of 2% on the 200-mesh screen. But that specification said 80% should pass the 200-screen. An operator who got 78% would pass it. Unless you take that into consideration you are going to have considerable difficulty

[1] *Jour. Amer. Ceram. Soc.*, 5 [4], Pt. 2, p. 36 (1922).

and the only person to make anything out of it will be the referee laboratories.

A. A. KLEIN:—Screens which check first will vary in time just from use.

J. M. MANOR:—That agrees with my observations. I think it would be a more fair proposition if Grade No. 1 on screen No. 140 were changed to .7 of 1% and 200 changed to 2%, on the basis of what it has been customary to furnish with satisfactory results to the trade; that is unless there is a desire to have it still finer than what they have been using.

A. S. WATTS:—We find as has been stated, that in the course of time screens will deteriorate but we have not found that that was extremely serious and I believe that by introducing a moderate tolerance you will not have a great deal of difficulty.

We have not been able to justify the use of more than three screens. I think three screens would suffice. With 100- or 80-mesh and the 200 and 325 a classification would be obtained which, with a reasonable tolerance, would be sufficiently accurate. The main thing in this screen classification is to have an operator of sufficient training or experience.

F. V. DRAKE:—I think you will find that the aperture in the screen made by the different manufacturers of screen, whether it says 200 or whatever it is, is controlled entirely by the diameter of the wire used in the manufacture of the screen. In the screening of your material the diameter of the wire used gives the aperture through which the material passes. You get a different gage wire and in that way you get a different aperture in your screen.

H. GOODWIN:—We find grinding plays an important part. This is one thing to be considered; the denser a semi-porcelain body the greater will be the tendency to dunting in kilns, and I suggest that in making up the classifications that this be taken into consideration. Of course, this can be overcome in part by proper balance in other body materials, or by giving kilns sufficient time to cool properly before opening up, but in these days of speed, kilns cannot be thrown over from one day to another in drawing, hence, the necessity of considering the fineness in grinding.

H. SPURRIER:—I propose that the schedule be amended to cover, say 6% plus. In other words, we have here what is desired and we accept 6% beyond that for each screen. For instance, on the 100-mesh, Grade 1, we have 0.25. We would tolerate 6% on the .25; or (25×1.06) or 0.265, which in the total will amount to more than is specified here. That would be enough to take care of the personal factor in making the tests. It is very difficult to take care of that. But a reasonable amount of care is presumed in all these things.

G. E. SLADEK:—We have conducted screen tests on all our flint and feldspar for ten years and the boys who do that are in high school. We showed them how and we found that, having two boys run the same tests,

we got little variation. We checked them with a standard. These screens have been used for some time and we find there is very little variation due to wearing. I think if the screen tests are conducted with any reasonable care you can get very accurate results on carload shipments.

R. B. LADOO:—The method of making the fineness test, as specified, seems unduly complicated. It is suggested that a simpler and probably equally accurate method is that used in the Washington Office of the Bureau of Mines. The procedure of screening is the same as that described except that the material is washed through the screen by means of a water spray from above instead of by splashing from below. A rubber tube is attached to a water pipe and a gentle spray made by pinching the end of the tube together with the finger. This method of sieving is more rapid than that recommended in the specifications and there is no danger of loss by slopping or by overflow. By this method all lumps are easily broken up and there is no danger of forcing the screen wires apart if a gentle spray is used.

SECRETARY TREISCHEL:—The next item is:

3. Moisture Content:

Unless otherwise specified the purchase price shall be based on moisture free material and the moisture content shall be determined as follows: 50 grams of the sample (paragraph 1) are carefully weighed out as soon as possible after sampling, and placed in an oven where a temperature between 105°C and 110°C is maintained with proper ventilation till the sample ceases to lose weight, and the loss in weight shall be calculated to per cent of the dry weight and so reported.

In case a suitable chemical balance is available the moisture test may be determined on a 5-gram sample.

Anything with reference to that on moisture content?

T. H. SANT:—I believe that was brought up a number of years ago. Most of the grinders will agree that it is almost impossible to load absolutely dry feldspar on account of the dust. You could not get workmen to unload it and you would not want it unloaded. Would not 2% moisture be acceptable?

C. C. TREISCHEL:—This classification does not restrict either the producer or the vendor to any certain water content. It just mentions the fact that purchase is desirable on the dry basis.

4. Fusion Behavior:

Test cones of the feldspar shall be made of standard dimensions, *i. e.*, $2^{7}/_{8}$" high (75 mm.) by $^{9}/_{16}$" (15 mm.) across the base of one face. The use of an organic bond such as dextrine or gum arabic, is permissible to ensure cones retaining form prior to fusion, but such added material must burn out completely and not affect the color of the fired material. The fusion behavior of the different feldspars shall be as follows for the grade 2 grind:

Grade A Feldspar shall fuse with or before Orton Cone 9
Grade B Feldspar shall fuse with or before Orton Cone 8
Grade C Feldspar shall fuse between Orton Cones 7 and 8
Grade D Feldspar shall fuse with or before Orton Cone 7

A MEMBER:—What of the potter who claims his maximum cone test is cone six?

J. B. SHAW:—Does this require that the fusion test will be made according to the test as adopted by the Standards Committee?

C. C. TREISCHEL:—All specifications from the SOCIETY will be referred to the Standards Committee and they will put in such things.

J. B. SHAW:—I asked that because it is a known fact that the cone at which the feldspar will fuse depends very largely upon the atmospheric conditions of the furnace and the time of fusion. It is necessary to specify most carefully those conditions before you could adopt anything very rigid in this matter.

C. C. TREISCHEL:—That point should be considered by the Committee in revising these classifications.

The next item is "Shipping:"

5. Shipping:

All material purchased under these specifications shall be shipped in clean closed cars.

6. Rejection:

The purchaser reserves the right to reject material which does not conform to the above specifications in every particular and to return rejected material to the vendor for full credit at price charged f.o.b. point of delivery specified by purchaser.

I am afraid that is going a little bit beyond a scope of a classification which is to be used as the basis for specifications and I personally would object to seeing this in a classification put out by the SOCIETY.

R. B. LADOO:—I have not noted any provision made for decisions on either analyses or screen tests or anything else.

A. S. WATTS:—Do the fusion temperatures indicated for Grades A, B, C and D line up with the compositions of the same data? I question whether a feldspar containing 10% or more of potash and 3.5% of soda and fusing at a temperature of approximately cone 9 could be diluted with flint until it had a composition of 8% potash, 2.5% soda and would fuse between cones 7 and 8. I do not believe that you would get that lowering of the fusion temperature due to simple dilution by flint. Can anyone on the Committee tell me if these tests have been carried out?

H. SPURRIER:—Not on feldspars of this composition, but closely related compositions and some of them taken from your own writing on this. I drew very freely on that, as on your specifications.

J. P. RODGERS:—The albites will fuse on cone 6, but a year ago I heard a member of this SOCIETY connected with the Terra Cotta Division state in the court room, under oath, that they would fuse at cone 3. I do not know whether they will or not. I have had tests of them made where they were well fused at cone 6. I never saw anything better than that.

A. S. WATTS:—Is it not true that albites contain a relatively high content of lime and magnesia?

J. P. RODGERS:—The Atlantic Terra Cotta Company told me that these particular albites contained about $2^1/_2\%$ of magnesia and lime.

J. M. MANOR:—With regard to the question just raised by Mr. Ladoo: How are these disputes going to be settled as between the producer and receiver? Both think they are right and both may be honest. How will it be settled?

C. C. TREISCHEL:—I think this whole matter will be taken up during the year. We want to take it up on the coöperative basis between the producer and consumer. These classifications have been made up in great part from the viewpoint of the consumer. This matter of variation in feldspar, of the desirability of classification and specification has been before us now for about three years. The only group who seems to have gotten anywhere have been the consumers. We have always welcomed the producer to get in and it has been our desire to have the producer present something definite. He will be requested to do that during the coming year, so that things of that sort will be worked out and a final classification presented possibly this year.

F. S. HUNT:—I should be very glad if the producers submit letters giving their ideas in writing. We have not had their opinions in writing to work on. We have had analyses, of course.

W. A. HULL:—I have been during the past year Chairman of the General Standards Committee of the SOCIETY and I am willing to accept full responsibility for the fact that these standard specifications were presented to the White Wares Division in present form to go through a process that specifications ought to go through in the Standards Committee.

Mr. Spurrier has done what I consider a good job for a one-, two- or three-man job, but Mr. Spurrier will agree with me that it was not a committee job. This is not as it should be. The fact is that if this SOCIETY is to work on specifications we must have Standards Committees that are large enough and representative enough to represent the best thought of all interests in the Division. A one- or two-man committee or four-man committee so situated that we can not get together and discuss these things and wasting the time of fifty men instead of ten or twelve is not right.

I wish to move that the White Wares Division has for the coming year a Standards Committee of not less than ten men, that producers be represented on it, that the Committee be selected if possible in such a way that it shall have a secretary who has stenographic help and shall be made up of men as far as possible whose concerns can afford to send them to at least three meetings in the course of a year, that this work that has been done here may be done up right during the coming year so that we shall

have the same sort of work that other societies that are really working on specifications are able to do.

The motion made by Mr. Hull was seconded and adopted, with the provision that the three meetings proposed should be held on dates other than those of the annual and summer meetings of the SOCIETY.

C. C. TREISCHEL:—Is there any formal disposition you want to take on this more or less formal classification you have before you?

It was moved, seconded and adopted that the proposed specifications for feldspar be referred back to the Committee on Standards for revision.

P. H. BATES:—Two other specifications I think have been referred to the General Standards Committee. I do not think they are any better or any worse than this one. Are you to reconsider your action on that and send them all back?

SECRETARY TREISCHEL:—I think as far as this Division is concerned we have done as much as we can on those. They have been referred to the General Standards Committee for further revision if they see fit.

W. A. HULL:—The General Standards Committee will make such disposition as seems best. They will probably refer them to the Standards Committee of this Division. The General Standards Committee is not so constituted that it can work on things of interest to but one Division. It is more coördinating. On any material of special interest to one Division the Standards Committee of that Division should do the work and put it forth in good form.

Do We Need Graded Specifications on Feldspar?

F. C. FLINT:—Is it necessary that we should grade feldspar according to its content of soda, alumina or silica, choosing certain percentages to call A, B or C grade? The mental implication that a B or C grade is inferior to an A grade is always present, which is a hindrance to the producer. The limits set for allowable variation inside of the grades is wide enough to be noticeable in use if shipments varied from one extreme to the other. Grading A, B or C according to cone fusions is only another way of stating that the feldspar fuses at cone 8 or 9. It would be simpler terminology to use the cones. Feldspar goes into such a variety of ware that it would be, strictly speaking, a difficult thing to make one specification of feldspar fit all kinds of material.

By way of example, coal would be graded A for coke use, B for producer gas, C for domestic, D for cannel. These grades could be made by analyses and soft coal is more uniform than feldspar, so could more easily be classified. But experience has shown it better to buy by analysis and size, stating the allowable limits of variation from the analysis.

Would it not be better to insist that the feldspar be purchased under speci-

fications giving its chemical analysis, grinding size, fusion, color, etc. This analysis to include not only alkalis, alumina and soda, but also all other elements appreciably present, for the magnesia and calcium contents affect its action as well as the chief ingredients. The fineness of grind should be expressed in a complete manner, showing the percentages on a number of screens, not percentage held on some one screen. The fusion should be given and also as soon as it is practical to do it, the content of other minerals, free silica or quartz, mica, hornblende, etc.

If a purchaser of feldspar obtains good results with any one typical specification, it would be very important to him to know what allowable free limit there should be in the various percentage constituents, sieve tests, etc.

The limits allowed by grading as proposed must be so wide that variation inside the classification could harm some products. To overcome this would make too many grades.

The discussion of specifications has brought out the fact that very few users of feldspar would use exactly the same specifications on the same ware and at the same time the producer would be hampered in trying to sell a feldspar which he could not change, but which specifications by their simpleness had made people try to use. In other words, if some large user of feldspar took a notion to a certain grade, there would be a tendency for other users to follow his grade, when probably their conditions would permit them to use another type of feldspar and some producers would be unable to fit the conditions.

Such a system would be more complicated in that each man would in a way set his own standard, but it would be simpler in that the standard is given directly in terms of constituents and not by an arbitrary set of grades. In glass alone there are a possible five grades which could be used. How about other products?

ACTIVITIES OF THE SOCIETY

WE ARE GROWING—BUT BRING ON THE TONIC

Thirty-two personal and seven corporations joined in support of the Society during the month of May 15 to June 14. There have been some resignations on account of withdrawal from the field of ceramics but a count of the membership cards checked by a ledger count shows that on June 14th the membership totaled 2030

The records are as follows:

	Personal	Corporation	Total	Net gain
June 14, 1923	1792	238	2030	203
January 14, 1923	1611	216	1827	338
January 14, 1922	1350	139	1489	

Comparison of the records from January to June 14th in 1922 and 1923.

	Personal	Corporation	Total
Net gain from Jan. 14 to June 14, 1923	181	22	203
Net gain from Jan. 1 to June 14, 1922	175	33	208

The Society lost 16 personals and 2 corporations during this last month by resignation. These losses are charged in so that the figures for June 14 are net as checked by actual count. This gives reason for the increase in 1923 up to June 14 being a little less than for the corresponding interval in 1922, but an enterprising man will neither give nor accept excuses for not doing better in this year of prosperity than was done in the slow year of 1922.

What are you, my fellow member, going to do about this? Do you feel the call to "be good to yourself" and to your neighbors? Will *you* not invite others to join?

The record of the individuals who have helped in keeping up the membership records for the period from May 15 to June 14 is as follows:

	Personal	Corporation		Personal	Corporation
H. Frost		1	Robt. V. Miller	1	
H. Goodwin		1	C. H. Modes	5	
W. J. Vollrath		1	L. M. Munshaw	1	
M. F. Beecher	1		C. L. Norton	1	
W. J. Benner	1		B. S. Radcliffe	1	
E. Hogenson, Jr.	1		Robt. Twells, Jr.	2	
R. K. Hursh	2		Otto W. Will	1	
R. N. Long	1		Office	14	4

Total 32 Personal, 7 Corporation

NEW MEMBERS RECEIVED FROM MAY 15 TO JUNE 14

Personal

Anderson, Louie S., Terra Cotta, Ill., Head Kiln Burner, American Terra Cotta Co.

Arthur, Edwin P., 8 University Place, Columbus, Ohio, Chemist, U. S. Window Glass Co.

Barnard, Randolph H., 810 Henry St., Alton, Ill., Batch and Furnace Dept., Illinois Glass Co.

Brown, Henry C., 98 Fulton St., Woodbridge, N. J., Lab. Assistant, Federal Terra Cotta Co.

Burt, William I., Maple Grove, Ohio, Chemist, The Dolomite Products Co.

Carhart, Daniel L., 2326 Edwards St., Alton, Ill., Asst. Supt., Illinois Glass Co.

Dinsmore, Francis W., Imperial Porcelain Works, Trenton, N. J.

Feder, T. M., Special Representative, Illinois Electric Porcelain Co., Macomb, Ill.

Geer, John D., Newell, W. Va., Ceramic Assistant, Knowles, Taylor and Knowles Co., East Liverpool, O.

Gouin, Roland J., 1025 George St., Alton, Ill., Plant Chemist, Illinois Glass Co.

Hasselmann, Mario Fred, Caixa Postal 1546, Rio de Janeiro, Brazil (New York, P. O. Box 122, Station F), Industrial Manager, Comp. Constructora em Cimento Armada.

Hutchinson, O. C. K., 311 Prospect St., Alton, Ill., Industrial Engineer Illinois Glass Co.

Jeffery, Benjamin Alfred, 741 Edison Ave., Detroit, Mich., Vice-Pres., Champion Porcelain Co.

Kanhäuser, Dr. Frank, Chodov u Karlovych Varu, Czechoslowakia, Managing Director, Dr. Tonder and Co., Refractories Works.

Lahey, John A., Sewaren, N. J., Chemical and Metallurgical Director.

Lamar, Mark O., Worcester, Mass., Chief Chemist, Norton Co.

Lambert, Kenneth Coghlan, 208 S. 18th Ave., Maywood, Ill., Student.

Lava, Vicente G., Bureau of Science, Manila, Philippines, Physical Chemist.

Lyons, Okey A., 5345 Belvidere Ave., Detroit, Mich., Dressler Kiln Operator, Champion Porcelain Co.

Magid, Hyman Singer, 2639 Rice St., Chicago, Ill., Student.

Martin, P. W., Dry Branch, Ga., Pres., American Clay Co.

McKeown, Thomas H., 434 Laurie St., Perth Amboy, N. J., Chemist, Roessler and Hasslacher Chemical Co.

Norton, Frederick H., Mass. Inst. of Technology, Cambridge, Mass., Babcock and Wilcox Co.

Purcell, Buruette, 5811 Manchester Ave., St. Louis, Mo., Ceramic Eng., St. Louis Terra Cotta Co.

Reed, Gordon W., 407 S. Dearborn St., Chicago, Ill., Staff, *Brick and Clay Record.*

Robinson, Chas. J., 107 Gibson St., Canandaigua, N. Y., Efficiency Engineer, Lisk Mfg. Co., Ltd.

Schabacker, H. E., 917 W. 6th St., Erie, Pa., President, The Erie Enameling Co.

Stevens, W. P., Bibb Bldg., Macon, Ga., Manager, Dixie Fireproofing Co.

Stohl, L. A., Sun-Prairie, Wis., Box 725, Gen. Mgr., Standard and Specialty Porcelain Works.

Topliff, George C., 713 Main St., Alton, Ill., Foreman, Illinois Glass Co.

Walters, Durwood B., 1407–47 S. 55th Ct., Cicero, Ill., Special Representative, Chicago Vitreous Enamel Products Co.

Wenning, J. W., 3313 Allendale St., Corliss Sta., Pittsburgh, Pa., Supt. and Vice-Pres., The Vitro Mfg. Co.

CORPORATIONS

Alberhill Coal and Clay Co., 1204 Lane Mortgage Bldg., Los Angeles, Cal., James H. Hill.

California Pottery Co., 579 Mills Bldg., San Francisco, Cal., J. F. Creegan, Secy.

The Falcon Tin Plate Co., Niles, Ohio, W. T. Brangham, Gen. Mgr. of Sales.

The H. K. Ferguson Co., 6523 Euclid Ave., Cleveland, Ohio, H. S. Jacoby, Secy.

Los Angeles Brick Co., 514 Security Bldg., Los Angeles, Cal., Gen. Mgr., L. S. Collins,

Mineral Products Co., 50 Congress Street, Boston, Mass., Frank P. Knight.

Polar Ware Co., Sheboygan, Wis., W. J. Vollrath, President.

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

E. E. Ayars gives Little Genesee, N. Y., as his address for the summer.

Earl Baldauf, who received his B.S. degree in ceramics from Ohio State University in June has accepted a position with the National Tile Co., at Anderson, Ind.

Leo A. Behrendt writes that his address is the Midland Terra Cotta Co., 105 W. Monroe St., Chicago, Ill.

George Blumenthal, Jr., of Alfred, N. Y., has recently affiliated himself with *Brick and Clay Record,* 407 South Dearborn St., Chicago, Ill.

J. S. Brogdon writes that his mailing address is Box 1864, Atlanta, Ga.

Horace T. Brown has removed from Alton, Ill., to 65 Hampton St., Bridgeton, N. J.

Lawrence H. Brown has severed his connection with the E. M. Knowles China Co. at Newell, W. Va., and has accepted a position with the Findlay Electric Porcelain Company, at Findlay, Ohio.

Joseph L. Buckley has changed his address from Rock Island, Ill., to the Hipper Bldg., Des Moines, Ia.

Edward Burkhalter, ceramics student at Ohio State University, is living at 1978 Iuka Ave., Columbus, O.

H. D. Callahan has moved to 436 E. Long St., Columbus, Ohio, from Keyport, N. J.

H. M. Christman gives as his address, Wooster St. Ext., Massillon, O.

Hugh Curran, 1923 graduate at O. S. U., has gone to his home in Bakersfield, Cal.

James R. Goodwin, who has been living at 1267 Kenilworth Ave., Coshochton, Ohio, has moved to 921 May St., East Liverpool, Ohio.

John Grainer requests that his mail be sent to Spring Lake, Mich. Mr. Grainer has been living recently in Hamilton, Ohio.

S. E. Hemsteger who received his degree in ceramic engineering has gone to Mt. Clemens, Mich., where he is employed by the Mt. Clemens Pottery Co.

Carl G. Hilgenberg writes that his correct address is Baltimore, Md. Mr. Hilgenberg is President of the Carr-Lowrey Glass Company at Baltimore.

W. M. Hughes, third year ceramic student at O. S. U., will be in Zanesville, Ohio for the summer.

A. A. Johnson who has been in Chicago, Ill., is now living at 529 Christie St., Ottawa, Ill.

Robert M. King, graduate student in ceramics at O. S. U. for the past two years received his Master's Degree in ceramic engineering in June. His mailing address at present is Box 373, Maryville, Tenn.

L. P. Kraus, Jr., Vice-President of the Kraus Research Laboratories, Inc., 110 West 40th St., New York City, is at that address, having left the Babcock and Wilcox Co., at East Liverpool, Ohio.

Albert Krekel is living at 2903 Chelsea Terrace, Baltimore, Md.

Wm. H. Lucktenberg, formerly Vice-President and General Manager of the Burton-Townsend Co., at Zanesville, Ohio has resigned his position. He is spending the summer with his family at Buckeye Lake, Ohio.

T. Poole Maynard gives as his new address 220 Hurt Bldg., Atlanta, Ga.

Crawford Massey, ceramics student, O. S. U. will be at 555 Moxahala Ave., Zanesville, Ohio for the summer.

Paul R. Morris, chemist with the Pittsburgh Plate Glass Co., has removed from 300 E. 9th Ave., Tarentum, Pa., to Charleroi, Pa.

C. H. Myers, superintendant of the Utah Fire Clay Co., wishes to notify his friends that he can be reached at Salt Lake City, Utah. His recent address has been Murray, Utah.

Paul Q. Quay of Euclid, Ohio, has moved from Euclid Ave., to Lake Shore Blvd., opposite 246th St.

R. J. Riley of the Indianapolis Terra Cotta Co., Indianapolis, Ind., has removed to the Brightwood Plant.

John E. Sachs lives at 1221-A Main St., Evansville, Ind.

A. E. Saunders, formerly with the Oriental Art Glass Co., at Chicago has moved to Toronto, Can., where he is manager of the Jefferson Glass Co., Ltd., 338 Carlaw Ave.

William Senn is living at 808 W. Adams St., Sandusky, Ohio.

R. R. Shively, has moved from Fairmont, W. Va., to 311 E. Bean St., Washington, Pa.

Charles S. Shoemaker has notified us that he has moved from Arnold, Pa., to 328 Main St., Belle Vernon, Pa.

Paul Teetor, formerly ceramic engineer with the State Geological Survey, Lawrence, Kan., is now at 12 McKinley Ave., Trenton, N. J.

R. W. Widemann of Paris, France has removed to 30 Rue des Dames (XVII).

Carl G. Zwerner writes that his new address is 29 So. West 8th St., Miami, Fla.

NORTHERN OHIO SECTION MEETING[1]

Minutes

The 17th regular meeting of the Northern Ohio Section, AMERICAN CERAMIC SOCIETY, met the Cleveland Engineering Society at their rooms at Hotel Winton, Cleveland, Ohio, Tuesday, April 24th, at 2:30 P.M.

At this business meeting the resignation of Arthur F. Gorton as Secretary of the Section was accepted, and George H. Hays was elected to fill out his term.

The matter of committees was discussed and suggestions made. Since then, Mr. Zopfi has appointed the following committees:

Membership Committee

1. Robert A. Weaver, President, Ferro Enamel Supply Co., 818 Finance Bldg., Cleveland, O.
2. F. P. Nickerson, W. S. Tyler Co., Cleveland, O.
3. L. W. Manion, 1370 Greenfield Ave., S. W., Canton, Ohio.

Program Committee

1. L. D. Mercer, United Alloy Steel Corp., Canton, Ohio.
2. G. T. Stowe, Cleveland Builders Supply & Brick Co., Leader-News Bldg., Cleveland, Ohio.
3. Philip Dressler, 1551 East Blvd., Cleveland, Ohio.

Executive Committee

1. The Executive Committee will be officers and councillor of the Division ex-officio, and
2. A. S. Walden, National Carbon Co., Cleveland, Ohio.
3. William M. Clark, National Lamp Works, East 152nd St., Cleveland, Ohio.

[1] By George H. Hays, Secretary Northern Ohio Section. AMERICAN CERAMIC SOCIETY.

The meeting adjourned for dinner, and at 8 o'clock P.M. assembled to hear Ross Purdy's lecture before the joint session of this Section and the Cleveland Engineering Society. The lecture, "Ceramics—The Science and Engineering Involved," was well given and well received by the 100 present. Mr. Purdy held his audience spell bound for nearly two hours, explaining more particularly the close relationship between Ceramic Engineering and Mechanical Engineering. The discussion of this paper lasted over 30 minutes and many very interesting points were brought out. Mr. Philip Dressler was called upon and gave a short and interesting description of the development of the tunnel kiln in this country.

The Section has had many flattering comments about this meeting, especially from the members of the Cleveland Engineering Society who attended.

FORTY-FIFTH ANNUAL CONVENTION OF THE ILLINOIS CLAY MANUFACTURERS' ASSOCIATION AND CHICAGO SECTION OF THE AMERICAN CERAMIC SOCIETY

TUESDAY, MAY 8
LASALLE HOTEL, CHICAGO, ILLINOIS

Morning Sessions

Indiana-Illinois Division American Face Brick Association
Meeting—LaSalle Hotel, 10 A.M.

Illinois Drain Tile Manufacturers' Association
Address, "Where is the End of Drainage?" By J. A. KING.
Meeting—LaSalle Hotel, 10 A.M.

Illinois Paving Manufacturers' Association
Meeting—Association Offices in Chamber of Commerce Building, 10 A.M.

The Hollow Building Tile Association
Meeting—LaSalle Hotel, 10 A.M.

Afternoon Joint Session

Program

"The Relation of Sales to Manufacturing"
By ALBERT H. SHEFFIELD, Secretary, American Terra Cotta Company

"What the Buyer Must Be Shown"
By JAMES A. KING, Editor, National Reclamation Magazine, St. Louis, Missouri

"The Production of Green Colors on Face Brick"
By RALPH K. HURSH, University of Illinois

"Efficiency in Clay Haulage"
By THOMAS N. MCVAY, University of Illinois

Dr. M. C. Leighton, state geologist-elect was present and made a few remarks to the members of the Association.

The following officers were elected for the coming year:
James C. Reeves, President (Streator, Ill.)
W. H. Brosman, Vice-President (Albion, Ill.)
C. W. Parmelee, Secy.-Treas. (Urbana, Ill.)

The Committee appointed to consider the question of the amalgamation of the Illinois Clay Manufacturers' Association and the Chicago Section of the American Ceramic Society reported that the Committee had carefully considered the matter and after consulting with some of the older members of the organization, they had come to the decision that this is not an opportune time for such a plan. They recommended that the by-laws be amended to provide for an Executive Committee which shall consist of the officers of the Association and one representative from each state organization interested in the production of clay wares.

Meeting of the Chicago Section[1]

Following the meeting of the Illinois Clay Manufacturers' Association, the Chicago Section of the SOCIETY, started the evening with a dinner at the Hamilton Club. Desiring to give the Clay Manufacturers something recreational after a rather full day, the evening was turned over to entertainment for the great part, instead of a heavy technical session. A troup of entertainers kept the crowd of forty-five good fellows amused during the meal and for another hour with song and dance and fun in general. After a few words by Mr. Leighton, the new state geologist, this was followed by the projection of the well-known "Tribune Film," showing the manufacture of paper from the Canadian pulp-wood camps all the way down to "Andy Gump" and "Skeeziks." This splendid educational feature was enjoyed by everyone present, and many compliments have already been received. A short Harold Lloyd comedy entitled "Pay Your Dues," closed the program with a gentle hint.

Associations having joint meetings were:

Illinois Clay Manufacturers' Association
Indiana-Illinois Division American Face Brick Association
Chicago Section of the AMERICAN CERAMIC SOCIETY
Illinois Drain Tile Manufacturers' Association
Illinois Paving Brick Association
Hollow Building Tile Association

MEETING OF ST. LOUIS SECTION[2]

The St. Louis Section of the AMERICAN CERAMIC SOCIETY held a joint meeting with the American Society of Mechanical Engineers and the American Chemical Society at the Gatesworth Hotel, St. Louis on May 18, 1923.

W. B. Chapman, member of the AMERICAN CERAMIC SOCIETY and President of the Chapman Engineering Company spoke on "Fuel Saving in Modern Gas Producers and Industrial Furnaces," illustrating his talk by lantern slides and papier-mâché models.

An illustrated talk was given by Paul V. Bunn, General Secretary of the St. Louis Chamber of Commerce, the subject being "A Trip to Cuba, Panama and Costa Rica." Entertainment was also furnished by Station KFEZ, the new radio broadcasting station of the St. Louis Section.

Officers were elected for the year 1923–24 for this Section of the SOCIETY as follows:

Frederick E. Bausch, Chairman
W. J. Knothe, Secy. and Treas.
Geo. E. Thomas, Chairman, Membership Comm.
Chas. W. Berry, Chairman, Program Comm.

[1] By H. E. Davis, Secy., Chicago Section, AMERICAN CERAMIC SOCIETY.

[2] By W. J. Knothe, Secy., St. Louis Section, AMERICAN CERAMIC SOCIETY.

OBITUARIES

Members of the American Ceramic Society will regret to learn of the death of Ellis Gates, which occurred at his home in Chicago on April 25, 1923. Mr. Gates, son of W. D. Gates, charter member of the Society, was born in Hinsdale, Ill., in 1880. He received his education in the Hinsdale Schools, the Chicago Manual Training School and the Ceramics Department at Ohio State University. He was connected with the American Terra Cotta and Ceramic Company in various capacities at different times. He was later superintendent of the Denney-Renton Terra Cotta Company and the Seattle Terra Cotta Company. From there he was employed in New York by the New York Architectural Company, later in charge of their Pittsburgh office, then in Mobile, Chicago, Denver, and Santa Fe. During the latter years he was fighting his fatal illness, tuberculosis.

On Monday, June 11, the death of Mr. Joseph Keele of the Department of Mines of Canada, occurred at Ottawa. He was well known for his contributions to the knowledge and literature of the clay resources of the Dominion.

Mr. Keele was born 59 years ago at Birr, Ireland, and came to Canada at the age of 15. He was educated at the University of Toronto and for several years was a member of the staff of the School of Practical Science.

In 1898 he was appointed to the Canadian Geological Survey and performed worthy geological work, including notable explorations in the Yukon and the Mackenzie River regions. Later he devoted particular attention to the Pleistocene formation which finally led to his specializing in the study of clays in general and their utilization. To further fit himself for this, he took a special course in ceramics at Cornell University under Professor Ries with whom he collaborated on the investigation of the clay deposits of the Western Provinces.

For three years he carried on his laboratory work on clays at the University of Toronto. In 1915 he was recalled to Ottawa and was transferred from the Geological Survey to the Mines Branch, for the purpose of organizing the Division of Ceramics. In his capacity as Chief of this Division he was able to be of great aid, as an adviser, to the clay industry throughout the entire Dominion. In 1921 he was transferred, at his own request, back to the Geological Survey.

He leaves, as a record of his contributions to the knowledge of the clays of Canada, valuable reports on the clay resources of all of the Provinces.

He was a member of the American Ceramic Society, Canadian National Clay Products Association (Honorary Member), Canadian Institute of Mining and Metallurgy, Town-planning Institute of Canada, and the Ottawa Field-Naturalist's Club.

Mr. Keele was a man of broad interests. Although naturally a lover of outdoor life and spending much of his leisure in the open, he was keenly interested in art, literature and music.

Besides his recognized scientific attainments, his enthusiasm and breadth of view were an inspiration and a help to his fellow workers and assistants. In a quiet unassuming way he made many warm friends, and these will sadly miss him.

Official Personnel of Divisions—1923–24

	Art	Enamel	Glass	Heavy Clay Products	Refractories	Terra Cotta	White Wares
Chairman	F. H. Rhead	H. F. Staley	A. R. Payne	R. B. Keplinger	E. E. Ayars	A. F. Hottinger	F. H. Riddle
Vice-Chairman	J. C. Boudreau		J. H. Forsyth	F. T. Owens	F. A. Harvey		
Secretary	H. S. Kirk	R. R. Danielson	A. E. Williams	Amos Potts	R. F. Ferguson	R. L. Clare	C. C. Treischel
Committee on Research	F. H. Rhead	R. R. Danielson	E. W. Tillotson E. W. Washburn	R. T. Stull G. W. Shoemaker Paul E. Cox R. K. Hursh	M. L. Bell A. A. Klein E. N. McGee A. S. Watts Francis R. Pyne	E. C. Hill Major Gates	F. K. Pence
Committee on Standards (*a*) Tests (*b*) Products	W. J. Stephani C. F. Binns	(*a*) E. P. Poste	Tests: A. E. Williams; L. R. Milford. Refractories: D. E. Sharp; C. E. Fulton; W. F. Brown; A. S. Zopfi; G. Aurien; C. O. Grafton	P. H. Bates W. G. Worcester S. Geijsbeek W. P. Blair	R. F. Ferguson M. C. Booze R. M. Howe	(*a*) C. W. Hill D. F. Albery (*b*) J. L. Carruthers	(*a*) G. Sladek A. V. Bleininger
Committee on Data	Conrad Dressler	T. D. Hartshorn	J. C. Hostetter	H. G. Schnrecht	L. J. Trostel F. A. Harvey A. S. Watts	T. A. Klinefelter	C. C. Treischel
Committee on Membership	H. S. Kirk	Karl Turk	F. C. Flint; J. B. Krak; R. R. Shively; G. H. Loomis; C. H. Modes; M. A. Smith; H. T. Bellamy; A. W. Kimes; R. F. Brenner; D. D. Schurtz; J. T. Keenan; H. W. Hess; F. B. Garrod; J. H. Forsyth	D. F. Stevens H. S. Vincent J. E. Randall	J. W. Hepplewhite E. H. VanSchoick Allan G. Wikoff	W. D. Gates G. M. Tucker A. L. Gladding	I. E. Sproat
Committee on Rules	F. H. Rhead		J. W. Wright	C. B. Harrop R. L. Hare W. W. Ittner	S. M. Kier R. M. Howe	R. L. Clare	August Staudt
Rep. on Committee on Nominations	Paul E. Cox	B. T. Sweely	W. F. Brown	C. F. Tefft		E. C. Hill	C. E. Jackson
Councillors	Mary G. Sheerer Hewitt Wilson W. D. Gates Frederic Carder Ira Sproat	H. C. Beasley W. C. Lindemann M. E. Manson D. F. Riess	J. C. Hostetter E. W. Tillotson D. E. Sharp J. Gillinder	C. F. Tefft		G. P. Fackt W. J. Stephani M. C. Gregory	
Com. on Papers and Program	F. H. Rhead				C. C. Bales J. S. McDowell L. C. Hewitt E. O. King M. C. Booze		
Education	J. C. Boudreau						

Personnel of Local Sections

	New England	Eastern	Pittsburgh District	Northern Ohio	Chicago	St. Louis	Detroit
Chairman	C. W. Saxe	Andrew Foltz	Alexander Silverman	A. S. Zopfi	B. T. Sweely	Frederick E. Bausch	F. H. Riddle
Vice-Chairman		Chas. W. Crane	Francis C. Flint	Emerson Poste	W. W. Wilkins		
Secretary		G. H. Brown	H. G. Schurecht	Geo. H. Hays	H. E. Davis	W. J. Knothe	
Treasurer			Thos. H. Sant				
Councillors		Chas. A. Bloomfield	Francis W. Walker	R. D. Landrum	C. W. Parmelee		
Membership			Alexander Silverman	R. A. Weaver F. P. Nickerson L. W. Manion	Alan G. Wikoff	Geo. E. Thomas	
Program			E. Ward Tillotson	L. D. Mercer G. T. Stowe Philip Dressler	D. F. Albery	Chas. W. Berry	
Rep. on Comm. on Nominations			E. Ward Tillotson		D. F. Albery		
Executive Committee		A. Foltz C. W. Crane G. H. Brown C. A. Bloomfield R. H. Minton Abel Hansen Chas. H. Cook August Staudt	A. Silverman A. F. Greaves-Walker E. W. Tillotson R. M. Howe H. G. Schurecht	A. S. Walden W. M. Clark	W. W. Wilkins H. E. Davis D. F. Albery A. G. Wikoff		

NOTES AND NEWS

HIGH HONOR FOR E. V. ESKESEN

Knight of Danebrog Conferred on Local Man by King of Denmark

"The decoration of Knight of Danebrog,[1] has been conferred upon Echardt V. Eskesen, president of the New Jersey Terra Cotta Company for his interests in this country in American-Danish activities, and the part he has taken in the interchange of students between Scandinavia and America. The decoration is one of honor; only two or three other Danes in the United States having been so honored by King Christian X.

"Danebrog is the name of the Danish flag. It is more than 1,000 years old; the oldest flag in the world.

"Mr. Eskesen has been prominent among the Danes of America for many years, at one time being president of the Danish-American Society of the United States. For a period of years he was trustee of the American-Scandinavian Foundation, a fund created by Mr. Poulsen of the Hecla Iron Works to aid in the education of students of Danish parents.

"Besides being president of the New Jersey Terra Cotta Company, Mr. Eskesen is also president of the Royal Copenhagen Porcelain and Danish Arts of 21 West 57th Street, New York City, and president of the National Terra Cotta Society, to which honor he was elected at the convention of the terra cotta industry at Atlantic City on April 20. Mr. Eskesen is also a director of the First National Bank this city and Treasurer of the Matawan Tile Co."

E. V. Eskesen.

At the age of twenty-three he was still holding a clerkship in Copenhagen. The political restrictions of the early 'nineties which, to the free spirited made life seem unbearable, may have contributed to some extent to his longing for the American freedom and opportunities, and it may be that the urgings of three brothers and a sister who had previously come to America was quite an influence but we believe it was the demand for exercise of Mr. Eskesen's inborn ability to achieve that constituted the strongest urging for America, the country where all have equal opportunities for full exercise of talents.

Mr. Eskesen has shown that his interests have been much broader than the earning of a livelihood and that they included others than himself and family. He always loved art, literature and music and sought every opportunity for cultural development of self in these lines. This life of the cultural resulted in contacts with men and ideals which gave a loving and lovable direction to his workaday thoughts and deeds.

The *World's Work* obtained from immigrants of different nations their early impressions of America and why they remained here. Mr. Eskesen's statement appeared in the February, 1921, issue. His simple beginnings and his honorable attainments prompt a statement of his formula for a successful life:—Work, study, love with the

[1] *Perth Amboy Evening News*, May 3, 1923.

cultural arts, and an active helping interest in his fellowmen. The following excerpt from the article in the *World's Work* is characteristic of Mr. Eskesen's ideals:

"Outside the gate I found my younger brother waiting for me. He had been working in a terra cotta factory. So after looking around for a couple of days we secured work as pressers in an architectural terra cotta plant located in Long Island City. It was hard and unusual work for me, my surroundings rough, ugly, depressing.

"The first years of an immigrant's life are always the hardest. These years leave their marks and are never forgotten. For the man who has to fight his way up from the bottom, it is work, work, work—hard, grinding work. But it is not this that leaves its mark—it is the fact that he is made to feel that he is an outsider, a Pariah. My early years in American were before the great influx of immigration from South and East Europe. The word "greenhorn" was then very much in use and was applied to any one who was not born here. It carried with it a stigma, and was meant to hurt.

For me, as for other ambitious immigrants, the first years in America were bare of leisure or recreation. After the hard, manual labor of the day, I went to evening schools to study English, bookkeeping, stenography, and many other things which I found necessary in order to advance myself. It was sometimes two schools in one evening. I had to put aside all those things that represent the finer ideals of life, music, art, literature. I had expected that I would have to give up for a time my writing and poetry; but I had not expected to find my life stripped so absolutely bare of even a reference to these things—the talk around the shop and outside was mostly about baseball and prizefights—so different from what I had been accustomed to in Denmark.

"After about four years of manual labor and study, I found in my selected trade the opportunity for success. The idea of making useful and beautiful things out of clay appealed to me as a happy combination of industry and art, of getting perhaps satisfactorily close to art. I took hold of this thing and stuck to it. The old desires of my boyhood, to rove and adventure, came to me, but I repressed them even though I sometimes felt that in doing so I was bridling part of my better self. I did not, like many of my countrymen, Jacob A. Riis for instance, strike out into the uncertain, wandering from place to place, depending on chance jobs between communing with nature. So my experience as an immigrant is commonplace."

CHANGES IN PERSONNEL AND ASSIGNMENTS

BUREAU OF MINES

Dr. Bowles Superintendent, New Ceramic Experiment Station

Dr. Oliver Bowles, mineral technologist of the Bureau of Mines, has been designated by the Secretary of the Interior as superintendent of the new mining experiment station of the Bureau to be established at Rutgers College, New Brunswick, N. J., which will specialize in problems involved in the production and utilization of the various non-metallic minerals. Dr. Bowles will enter upon his new duties July 1.

Dr. Bowles was born in Canada and educated at the University of Toronto, obtaining his degree of B.A. in 1907, and of M.A. in 1908. The degree of Doctor of Philosophy was conferred by George Washington University in 1922. He was engaged in field work for the Ontario Bureau of Mines during 1908–1910, and was instructor in petrography at the University of Michigan in 1908–09. Until 1914 he lectured on rocks and minerals at the University of Minnesota, and made a comprehensive study of Minnesota quarries. The results of this work have been published as *Bulletin*, No. 663

of the U. S. Geological Survey. Since 1914 Dr. Bowles has been stone quarry and non-metallic specialist in the Bureau of Mines, and has written many technical papers and articles. His labors have recently been directed chiefly toward quarrying problems in the lime industry.

The new station will undertake selected problems in mining, treatment of non-ceramic uses of such non-metallic minerals as bauxite, feldspar, Fuller's earth, graphite, gypsum, limestone, mica, phosphate rock, salt, sand and gravel, slate, sulphur, garnet, asbestos, and talc.

Dr. S. C. Lind, Chief Chemist, Bureau of Mines

Dr. Lind, who will assume the position of chief chemist of the Bureau of Mines on July 1, studied at Washington and Lee University, Massachusetts Institute of Technology, the University of Leipzig, the University of Paris, and the Radium Institute of Vienna. In 1912, while acting as assistant professor of chemistry at the University of Michigan, he was appointed physical chemist with the Bureau of Mines. Later he was detailed to take charge of the Bureau's Rare and Precious Metals Experiment Station at Reno, Nevada. His chief work at that station has been on radioactivity, radium extraction and measurements; the influence of radiation on chemical reaction; and the relations of gaseous ionization to chemical action. Dr. Lind is the inventor of the well-known Lind interchangeable electroscope, used in the examination of rare metals and gases.

Courtesy of Harris & Ewing

DR. SAMUEL C. LIND.

Dr. Moore to Enter Firm of Consulting Chemists and Metallurgists

Dr. Richard B. Moore, chief chemist of the Department of the Interior, Bureau of Mines, has resigned his post to take effect June 1. Dr. Moore will enter the commercial field with a well-known firm of consulting chemists and metallurgists in New York City.

Previous to his governmental service, Dr. Moore was closely associated with Sir William Ramsey, the eminent English chemical investigator, in research work on the rare gases. In 1911 he was appointed assistant chief of the division of chemical and physical investigations in the Bureau of Soils, Department of Agriculture. While with the Bureau of Soils, he became much interested in the possibilities of the development of the radio-active ores of southwestern Colorado and eastern Utah, and this led to his transfer in 1912 to the Bureau of Mines and to his being detailed to establish a rare metals experiment station of the bureau in Denver.

Dr. Moore initiated the bureau's program for the production of radium in the United States from the Colorado and Utah ores, which were being shipped to Europe and concentrated there. By the application of processes developed by radium having a market value of nearly one million dollars was produced through a coöperative

agreement between the Department of the Interior and the National Radium Institute. Dr. Moore was largely instrumental in bringing to the attention of American medical men the value of radium in cancer treatment, and in encouraging the use of mesothorium as a substitute for the infinitely more valuable radium in the manufacture of luminous paint. The widest recognition has been accorded Dr. Moore on account of his investigative work on radio-activity and the chemical separation of radio-active types of matter, on the atomic weights of Krypton and xenon, the metallurgy of rare metals, and the liquefaction of gases. Of recent years he has directed the research work of the Bureau of Mines in the practical recovery of helium from natural gas, and it is largely through his work in the Bureau that the cost of this element has reduced from $1,200 per cubic foot to 10 cents, with the promise of further reduction in cost to 3 or 4 cents.

EXHIBITION OF INDUSTRIALLY MADE TABLE WARE

The Arts and Crafts Club, New Orleans

By Mary G. Sheerer

The Arts and Crafts Club of New Orleans, located in one of the oldest houses in the "Vieux Carre," one that has been illustrated many times as typical of the historic French régime, was established to foster a higher appreciation of the arts and crafts of today.

The Club has constantly changing exhibitions of original paintings and crafts, but none of the industrially made wares have been shown. Awakening to the fact that the large mass of people are using the commercial table wares and that more interest should be taken in what most of us use, as well as having a desire to help educate the taste of the public, a small but very interesting display was held of the Onondaga, Sebring, Knowles, Taylor & Knowles, and Lennox Belleek.

The latter, of course, is in a different class, as decalcomanias are not used, but as it is produced in quantity, it was included. The soft, creamy color of the Belleek with its high degree of finish and rich design would lend distinction to any exhibition.

The Onondaga combines a vitrified, well-finished body with variety and snap to the design and color. Obviously the appeal is made to the more educated public. When we remember that only a few years ago we were eating from a plate covered with a realistic landscape, men and women, cupids, fish careening about, fruit, etc., we realize our taste is improving.

The Sebring is to be congratulated on its choice of form, a portion of it grooved, each piece good in proportion and shape. The simple band design at the edge is perhaps the most appropriate to the form, but the Chinese landscape is very attractive in color and spacing, landscape used as design not as a picture. Some of the other designs seem to have been put on without consideration of the form and style of the body.

The Knowles, Taylor and Knowles, a semi-vitreous ware like the Sebring, has a bird and flower arrangement which is Japanese or Chinese in treatment, and which is in very good taste in design and color.

Most of the designs, however, are characterized by neatness rather than freshness and freedom back of which latter are liked by the public as evidenced by the popularity of the best English and Japanese types.

Newcomb College
New Orleans, La.

U. S. STANDARD SIEVE SERIES[1]

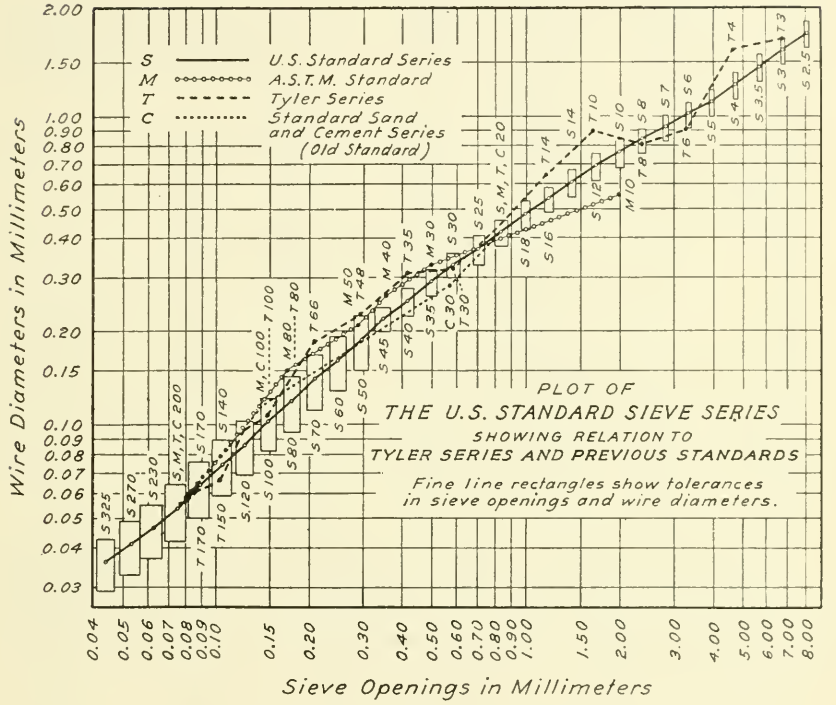

Table of Fundamental Data

STANDARD SPECIFICATIONS FOR SIEVES

Sieve no.	Sieve opening, millimeters	Sieve opening, inches	Wire diameter, millimeters	Wire diameter, inches	Tolerance in average opening, per cent	Tolerance in wire diameter per cent	Tolerance in maximum opening per cent
2½	8.00	0.315	1.85	0.073	1	5	10
3	6.73	.265	1.65	.065	1	5	10
3½	5.66	.223	1.45	.057	1	5	10
4	4.76	.187	1.27	.050	1	5	10
5	4.00	.157	1.12	.044	1	5	10
6	3.36	.132	1.02	.040	1	5	10
7	2.83	.111	.92	.036	1	5	10
8	2.38	.0937	.84	.0331	2	5	10
10	2.00	.0787	.76	.0299	2	5	10
12	1.68	.0661	.69	.0272	2	5	10
14	1.41	.0555	.61	.0240	2	5	10
16	1.19	.0469	.54	.0213	2	5	10
18	1.00	.0394	.48	.0189	2	5	10
20	.84	.0331	.42	.0165	3	5	25

[1] Bureau of Standards, Washington, D. C.

STANDARD SPECIFICATIONS FOR SIEVES (*continued*)

Sieve no.	Sieve opening, millimeters	Sieve opening, inches	Wire diameter, millimeters	Wire diameter inches	Tolerance in average opening, per cent	Tolerance in wire diameter per cent	Tolerance in maximum opening per cent
25	.71	.0280	.37	.0146	3	5	25
30	.59	.0232	.33	.0130	3	5	25
35	.50	.0197	.29	.0114	3	5	25
40	.42	.0165	.25	.0098	3	5	25
45	.35	.0138	.22	.0087	3	5	25
50	.297	.0117	.188	.0074	4	10	40
60	.250	.0098	.162	.0064	4	10	40
70	.210	.0083	.140	.0055	4	10	40
80	.177	.0070	.119	.0047	4	10	40
100	.149	.0059	.102	.0040	4	10	40
120	.125	.0049	.086	.0034	4	10	40
140	.105	.0041	.074	.0029	5	15	60
170	.088	.0035	.063	.0025	5	15	60
200	.074	.0029	.053	.0021	5	15	60
230	.062	.0024	.046	.0018	5	15	60
270	.053	.0021	.041	.0016	5	15	60
325	.044	.0017	.036	.0014	5	15	60

NOTE: In order to utilize cloth now on the market, it will be permissible, until further notice is given to the contrary, to use wire whose diameter is within a tolerance of 10% for the first three groups and 20% for the last two groups. Until notice is given to the contrary, the allowable tolerances on average openings will be 50% more than those given in the above Table.

WASHINGTON, D. C.

STANDARDIZATION OF CRUCIBLE SIZES

BY C. H. ROHRBACH

The Plumbago Crucible Manufacturers of the United States have recently completed, after more than two years' investigation, planning and experimentation, what is undoubtedly the most important work ever undertaken in that industry, namely, the standardization of crucible sizes on a scientific basis.

Exterior shapes and dimensions were worked out for each size so that they would have a true and uniform relationship to every other size, the basis for capacity being 3 pounds of molten copper per number with an allowance of 10% for working space. It was found that this gave an increased capacity on the larger sizes, but that on the sizes from No. 100 down it gave a smaller crucible than had previously been supplied by most of the crucible manufacturers, and a crucible user who, for example, had been using a No. 50 pot, would have to order a No. 60 in the new size to give him the capacity to which he had been accustomed.

To avoid endless confusion and friction with the trade it was determined to adopt the new standards on the basis that had been developed and step them back to the next lower number covering all sizes below No. 100. The dimensions of a theoretical No. 110 pot were used for the new No. 100 size. Under this plan, practically all of the new sizes come close to the average capacities of the old style pots formerly manufactured, *and the user may continue to purchase the size to which he has been accustomed.*

The "American Standard," as the new sizes are designated, is being received with

genuine appreciation by the trade because of the fact that more than ninety per cent of the crucible output of the country is now being made in these sizes, therefore a crucible user can buy pots from almost any crucible manufacturer and not be compelled to change his tongs to suit each new lot of crucibles that he may want to try out. Needless to say the tong manufacturers welcome the opportunity to standardize on one size of tong for each number of crucible.

The new sizes are as follows:

STANDARD SIZES OF BRASS CRUCIBLES

Number	Height, inches	Top, inches	Bilge, inches	Bottom, inches	Approx. cap. in pounds, water
0	2	1 5/8	1 3/4	1 1/4	
00	2 1/4	2	2	1 1/2	
000	2 5/8	2 1/8	2 1/8	1 5/8	
0000	3	2 5/8	2 5/8	1 3/4	
1	3 5/8	3 1/8	3 3/8	2 3/8	.39
2	4 1/4	3 1/2	3 7/8	2 7/8	.78
3	4 7/8	4	4 1/2	3 1/2	1.17
4	5 1/2	4 1/2	5	3 3/4	1.82
5	6 1/8	4 7/8	5 3/8	4	2.21
6	6 1/2	5 1/4	5 3/4	4 1/4	2.60
8	6 7/8	5 7/8	6 1/8	4 1/2	3.13
10	8 1/16	6 1/16	6 9/16	4 13/16	4.8
12	8 1/2	6 3/8	6 7/8	5 1/16	5.6
14	8 7/8	6 11/16	7 3/16	5 1/4	6.4
16	9 1/4	6 15/16	7 1/2	5 1/2	7.2
18	9 13/16	7 5/16	7 15/16	5 13/16	8.6
20	10 5/16	7 11/16	8 3/8	6 1/8	10
25	10 15/16	8 3/16	8 7/8	6 1/2	12
30	11 1/2	8 5/8	9 5/16	6 13/16	14
35	12	9	9 3/4	7 1/8	16
40	12 1/2	9 3/8	10 1/8	7 7/16	18
45	13 3/16	9 7/8	10 11/16	7 13/16	21
50	13 3/4	10 1/4	11 1/8	8 1/8	24
60	14 7/16	10 13/16	11 11/16	8 9/16	28
70	15 1/16	11 1/4	12 3/16	8 15/16	32
80	15 5/8	11 11/16	12 11/16	9 1/4	36
90	16 3/16	12 1/8	13 1/8	9 9/16	40
100	16 11/16	12 1/2	13 1/2	9 7/8	44
125	17 3/8	13	14 1/16	10 5/16	50
150	18 3/8	13 3/4	14 7/8	10 7/8	60
175	19 1/4	14 3/8	15 9/16	11 3/8	70
200	20	15	16 1/4	11 7/8	80
225	20 3/4	15 1/2	16 13/16	12 5/16	90
250	21 3/8	16	17 5/16	12 11/16	100
275	22	16 7/16	17 13/16	13	110
300	22 1/2	16 7/8	18 1/4	13 3/8	120
400	24 5/16	18 3/16	19 11/16	14 7/16	160

1 lb. water = .96 pints or 27.7 cubic inches.

NOTE: The Plumbago Crucible Association was organized July 15, 1919 and its activities along technical lines have thus far been confined mostly to the standardization of sizes. The officers of the Association are: H. A. Ross, President, Ross-Tacony Crucible Co., Philadelphia, Pa.; D. N. Clark, Vice-President, President, Naugatuck Valley Crucible Co., Shelton, Conn.

PLAN ESTABLISHMENT OF SCHOOL OF CERAMICS AT GEORGIA TECH[1]

Decision Reached at Atlanta Meeting of Georgia Producers of Clay Products Who Form Permanent Organization

A permanent organization of Georgia producers interested in the clay products industries in the state, was perfected at a called meeting held in Atlanta recently, and definite arrangements made for the establishment at the Georgia School of Technology, in Atlanta, of a school in ceramic engineering.

B. Mifflin Hood, president of the B. Mifflin Hood Brick company of Atlanta, was named general chairman of the permanent organization, and J. D. McCartney, of Savannah, Ga. secretary. The motto of the organization is "Educate Georgia Boys to Develop Georgia."

The various companies represented at the meeting donated a large part of the building materials and money that will be required for the construction of the school, among them being $1,500 worth of buliding materials by the B. Mifflin Hood Brick Company; $1,500 worth of laboratory equipment by the Central of Georgia Railroad, and $1,000 worth of equipment by the Atlanta Terra Cotta Company. Other contributions of a similar nature are expected from the affiliated industries throughout the state.

Another state-wide meeting is to be held at the Georgia School on May 29, at which time committees will be appointed for conducting a state-wide campaign for support of the proposed school, which, it is expected will be ready within a year.

Those in charge of the ceramic engineering school estimate that construction of the first unit, including laboratories, class-rooms, and so forth, will cost about $18,000 to $20,000, and that maintenance will be around $8,000 per year. It is proposed to build the school so that other units can be added later on.

The campaign to secure the needed funds is already under way, and Mr. Hood reports that he is meeting with such success that the project now has become an assured fact. He states too, that at a further meeting to be held May 22 in Atlanta the final arrangements and plans for the school are to be discussed, and that it will probably be known at that time just when work will be started.

A PROJECT WORTHY OF SUPPORT

The project to supply to science and industry a publication of physical and chemical constants is making very definite progress. The value of this undertaking cannot be over-emphasized. The missing data are so important, the uncertain data so much, that the effort to critically evaluate data already in existence and to encourage investigations and stimulate researches to provide new data is an undertaking that has immense possibilities to industry and science.

[1] *Evening Review*, East Liverpool, Ohio.

The publication will be known as "International Critical Tables of Numerical Data of Physics, Chemistry and Technology." Proposed by the American delegates at the meeting of the International Union of Pure and Applied Chemistry in London, 1919, this project was approved by the Union and the International Research Council and the responsibility of carrying it out assigned to America.

The editors are at work at the headquarters of the National Research Council, which has organized the project through a Board of Trustees and an Editorial Board. Dr. E. W. Washburn is chairman of the editorial board and editor-in-chief.

In the choice of the data to be secured careful consideration has been given by the editorial board to the needs of industrial and technical men as well as of the more academic research men. Effort has been made to learn the constants that are needed in industry, and arrangements are being made to try to provide these. Much information not hitherto published, but ascertained, will be included. Specialists in both Europe and America have been enlisted.

It is necessary to underwrite this project, the National Research Council not having funds of its own for such a purpose. Industry is, therefore, being asked to provide the support. It is estimated that not less than $200,000 will be needed, and roughly $75,000 has already been raised or subscribed. The Board of Trustees is anxious to secure as soon as possible $125,000 still needed, so that there shall be no unnecessary delay in the publication of what is recognized as one of the most needed and valuable pieces of work for the benefit of science, industry, and the country at large.

RESEARCH FELLOWSHIPS IN CERAMICS

Engineering Experiment Station and U. S. Bureau of Mines at Ohio State University

During the past year two men have done their work for their doctorate at O. S. U. with the Bureau of Mines, Ceramic Experiment Station. Both investigations have been in the field of refractories. The arrangement has been so satisfactory to all parties concerned that three fellowships have been established for the ensuing school year whereby a man may spend his entire time with the Bureau doing the work on a problem agreed upon between the department in the College in which the fellow is doing his major work and the superintendent of the Bureau. The University is operating through the Engineering Experiment Station. The director of this Station has appointed a Committee consisting of the heads of the departments of ceramics, metallurgy and chemistry to choose appropriate problems and to select the incumbents. The fellowships carry a stipend of $750 a year.

CONTEST DATE ADVANCED

The closing date for the contest announced by the Vitreous Enameling Company of Cleveland to secure a *new idea* for an enameled product has been advanced to August 1. Correct information regarding this contest may be found in the advertisements in the June *Journal*, p. 3.

IMPORTANT MEETINGS OF AMERICAN CERAMIC SOCIETY

SUMMER MEETING—Toledo, Detroit and vicinity, August 8–9–10 and 11. A wide variety of plants to be visited. Pleasant excursions and entertainments. Detailed program will be mailed later.

FALL MEETING—National Exposition of Chemical Industries, week of September 17, New York City. Wednesday, September 19, is Ceramic day. The Society plans a profitable technical program.

CALENDAR OF CONVENTIONS

American Ceramic Society (Annual Meeting)—Atlantic City, Feb. 4, 5 and 6, 1924.
American Ceramic Society (Summer Meeting)—Toledo, Detroit and vicinity, August 8, 9, 10 and 11, 1923.
American Chemical Society (Fall Meeting)—Milwaukee, Wis., Sept. 10 to 14, 1923.
American Electrochemical Society (44th Meeting)—Dayton, Ohio, Sept. 27 to 29 (Dates Provisional).
American Electroplaters' Society—Providence, R. I., July 2–5.
American Face Brick Association—First Week in December.
American Face Brick Association (Southern Group)—West Baden, Ind., November.
American Gas Association—Atlantic City, Oct. 15 to 20.
Clay Products Association—Chicago, Ill., Third Tuesday each month.
Fire Underwriters' Association of the Northwest—Chicago, Ill., Oct. 17–18.
National Exposition of Chemical Industries (Ninth)—New York, Sept. 17–22.
Sanitary Potters' Association—Pittsburgh, Pa., Monthly Meetings.
Tile Manufacturers' Credit Association—Beaver Falls, Pa., Quarterly Meetings.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings of the Society, Discussions of Plant Problems, Discussions of Technical and Scientific Questions and Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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Vol. 2 August, 1923 No. 8

EDITORIALS

CERAMIC SCHOOL CURRICULA

In the days when all shops were of small production there was no felt need for school trained men. The man who had sufficient imagination and creative ability to make a salable product had naturally the ability to find and to use the knowledge then available. The technical problems were handled sufficiently well by men schooled by experience.

Time was (and to many it still is) when skill of the "experts" was thought to consist more of knowledge of materials and mixtures than of creative and managerial ability. As a matter of fact formulas have been available for several decades to all who would read or who would purchase. Ceramic mixtures have been of value only to those who possessed vision and the creative genius of translating formulas into serviceable products. There can be no discounting the ability and economic value of the experience taught experts. Their worth can be fairly judged by the quality of wares they produce. It is the change in manufacturing conditions and the rapidly increasing quality demand that has made it necessary that the training of "experts" includes a thorough and broad searching of the fundamental sciences as applied to ceramics.

The "experts" needed by the manufacturers of refractories are those able to analyze the service conditions which the refractories must meet. These service conditions are increasing in variety and severity. New

products involving new methods of production are needed. The expert must explore the material resources and devise methods of manufacturing.

Such is the task of the "expert" in the production of any ceramic ware; glass, spark plugs, porcelain insulators, chemical wares, sewer pipe, hollow building tile, architectural products or enameled wares.

An Ideal Course of Training

How can a college best train men for service in the ceramic industries? Of what should the curriculum comprise? These questions are being asked alike by the instructors and by the employers. The instructors are anxious to prepare their pupils for the most efficient service and the employers wish to learn how best to use the pupils.

It is taken for granted that the collegiate course will include training in the fundamental sciences and in such cultural studies as will equip the pupil to creditably discharge his social and civil obligations. These are essential foundations for special ceramic training.

1. Ceramic Products

Rather than general lectures and laboratory exercises on porcelain compositions it would seem more beneficial to approach the study of porcelains from the service which porcelains must give. This would call for an analysis of the essential properties of porcelain products and the influence of constitution, structure, dimensions and shape on these properties. Porcelain now on the market could be tested and the conditions of use studied.

Such a study of ceramic products could be made on specimens of known compositions, designs and methods of manufacture. Most manufacturers would gladly coöperate with the colleges by making the test pieces and giving information regarding the essential properties. Both users and producers would collaborate with the colleges in devising means of testing.

The teaching of ceramic technology on this sort of program would necessitate a stock of test pieces that would be more than a museum of specimens. It would require access to quite a variety of testing apparatus but probably very few not to be found in University laboratories.

2. Ceramic Processes

Collegiate schools cannot furnish opportunity for practice in forming wares. A general knowledge of processes can be had by week end shop inspections or by scheduled plant visits.

There are some decorating processes which could be demonstrated and with which the pupils should obtain personal experience. Such demonstrations could be in the nature of laboratory work at the school or in a plant.

There are experiments in processes that could with profit be given, such as the use of electrolytes in casting slips and in plastic mixtures of

all sorts. These also could be in the nature of laboratory or plant demonstrations.

3. Ceramic Engineering

Every ceramic student should have a thorough course in drafting and designing including chemistry and thermo-dynamics of fuel burning and power production. It is important that the ceramist shall know how to conceive and to put his conceptions into working drawings.

4. Process Control

Control of manufacturing processes by analysis of materials and products, (measurements of temperature, drafts and pressures and of volume changes, etc.) will be the largest task of ceramic graduates. Compounding of mixtures and experimenting with new materials will continue for all time in any factory but the greater responsibilities will be in the instituting and continuing of factory control devices and methods. The larger the plant or the more exacting the specifications of product the more important is process control.

Pyrometry and other physical and chemical measurements would constitute a course in this ideal curriculum. Familiarity with precision methods and apparati is quite essential.

5. Promotion and Development of Products

If a graduate has not the ability to vision new uses, new products, new color or structural effects he will be doomed to routine services. This same appreciation of promotion and development applied to factory management is essential in large plant production. Lectures on promotion and development of products and human engineering is a cultural course which every industrial worker should take.

Summary

The ideal curriculum then would not stress compounding of ceramic materials. It would stress the essentials in process control and the production of wares to meet specific requirements.

It would develop the inventive ability of the pupils and give familiarity with precision methods and instruments. Rather than emphasize routine empirical mixing without vision of the exact requirements of the ware to be produced it would stress the reasons for the materials, mixtures and processes used. It approaches ceramic problems with the knowledge of what is wanted and a question of how to produce it. In this it differs from much of the present day school exercises of making a series of type mixtures with no other aim than to familiarize the students with the several types without more than inference to their possible industrial use.

Ceramic industries are today in need of experts who can produce wares that will meet exacting specifications. The colleges should be training their pupils to meet this need.

GREETINGS FROM PRESIDENT GREAVES-WALKER

The SOCIETY now has 2053 members on its roster.

It publishes a 170 page *Journal* each month.

The July *Journal* contained 95 pages original researches, 29 pages of abstracts and 47 pages of discussions and notes.

The SOCIETY has published 19 volumes of annual transactions and is now issuing Volume 6 of the *Journal*.

1278 pages of valuable material has been published this year including the July *Journal*.

The SOCIETY translated the Collected Writings of H. A. Seger and is now engaged in translating a new book by Dr. Singer.

The SOCIETY has published two bibliographies, has two in press and one in preparation.

It initiated and campaigned to successful issue the forming of Ceramic stations in the Federal Bureaus.

It assisted in the instituting and organizing of four collegiate ceramic departments.

The SOCIETY holds an annual convention in February for the presentation and discussion of papers, a "Summer Meeting" in August for plant visits, and a "Fall Meeting" in connection with the National Exposition of Chemical Industries for educational promotion.

The SOCIETY has seven Industrial Divisions; Art, Enamel, Glass, Heavy Clay Products, Refractories, Terra Cotta and White Wares. These Divisions have their own officers, committees and rules. They are self-governing and have a representation on the Board of Trustees.

The SOCIETY has seven Local Sections, the eighth one now under petition. These likewise are self-governing.

This scheme of organization is an effective decentralization of activities through centralized assistance and coördination making possible unit coöperation with all other industrial and educational groups.

This is your SOCIETY, your opportunity and your duty to yourself and to the profession of your adoption. The ceramic industries will benefit from your continued and aggressive support, but yourself will be the more greatly benefited in proportion to the extent you actively serve in the affairs of the SOCIETY.

We should have many more than 2000 members. Our net increase this year is 19 less than it was last year at this time.

The larger the membership support the larger will be the returns to each member.

We should have more corporation members.

Will you not present the SOCIETY'S past achievements and the present program of service to those who are not now members? Do this and your own returns will be greater.

PAPERS AND DISCUSSIONS

TRAINING OF ARTISTS FOR THE INDUSTRY

By J. Bailey Ellis

The College of Fine Arts is one of the subdivisions of the Carnegie Institute of Technology, which in turn is connected with Carnegie Institute and Museum. In the College of Fine Arts are housed six departments. We have as the oldest department the Department of Architecture; then we have a Department of Painting and Illustration, the Department of Music, Department of Drama, and the Department of Sculpture. The youngest department is the one I am especially interested in, which is called the Department of Applied Art. In this department we have a curricula which requires a general pursuit of certain courses for the first two years.

While each department is primarily interested in training its students for some specific field in the fine arts, the students are required during the four years they are with us to pursue certain courses in general studies as we call them, so that after the successful completion of any one of the curricula that student is eligible for a Bachelor of Arts degree. We give the required amount of English (two years of college English), two years of a modern language, history of civilization and general history of the arts, the history of costume, history of furniture, all strong history courses. We place these several courses into the curricula without interfering with the main part of the day in which the students can do their best work in the technical field. Most of these general studies come either in the early morning periods or the late afternoon.

In the Department of Applied Art, we require all of our students to follow a general curriculum for their first two years, because we believe that no matter in what field a student is eventually going to apply his art training, a certain foundation program and knowledge is necessary. Elementary design applies as much to some student who is going to function as a potter as it does to some one going in for costume designing or interior decoration. We think all of our students should acquire a certain ability to draw, to reproduce what is set up before them, therefore, this foundation training in the first two years.

Then, according to the way they develop, to the bent they show after going through these several courses, according to the thing they seem to feel they want to pursue, which very often is a complete change from the call that they had in mind when they first came to us, they may elect to specialize for their junior and senior years any one of five options. In each of these options it is possible for a student to make even a closer specialization.

First of all, there is a crafts option or craft specialization, and in that option we have pottery, jewelry and metal working, block printing and weaving.

A second option is given for costume design and illustration, where we are training students to design wearable costumes and makeable costumes.

We have an option in normal art, for the training of teachers to function in the public school systems or colleges throughout the United States.

There is another option in advertising and printing design, where our aim is to turn out a student who shall function, not as an illustrator, but as one who can illustrate, who knows something of color, of inks, of paper stuff, of type faces, who has had certain experience in type setting, in the processes of press work and reproduction. That student should be in position to take charge of the art end of an advertising establishment, or to be an art advertising man for a large printing concern. It is becoming more and more an accomplished fact that large print shops with a reputation are finding it well worth their while to go into the field of a complete job from the layout, the copy-writing through to the finished work.

Another option which we call Industrial Arts Design includes interior decoration, specialized furniture design, stained glass and wall paper design.

We have certain advantages at Carnegie Institute of Technology that no art school in the country has in equal proportion. The College of Fine Arts is one of four colleges, and in addition to the four colleges we have a division of general studies which takes charge of the faculties teaching the history, English and the languages courses, etc.

There are also a number of bureaus, coöperating with different concerns, making close contacts with business concerns and manufacturers outside of the College.

It is possible for the Department of Applied Art to so develop the curricula that a student who is specializing with us in costume designing can be sent over to the Margaret Morrison College to the department of costume economics for certain courses in draping, in dressmaking and pattern crafting. Students, therefore, who are not going to become dressmakers or costume economists primarily but who go into the costume fields, will have the opportunity of getting first hand information and experience in the technical and material limitations for which they are to design. It is also possible for any students following the advertising option to go into the department of printing in the College of Industries and have certain intimate experience with types and inks, because the department of printing has quite a complete shop within itself. And so on through the various options. By having departments in other colleges which are training students for certain fields in which art has a specific and legitimate use, our program offers close contact with the actual mechanical experiences, so that students can get a certain amount of that direct information neces-

sary to turn out a designer who can successfully design for the particular purpose or trade in which he is interested.

This is the thing we shall have to develop more and more in this country. There are a large number of schools turning out students, who after they have left school must gain the experience necessary to make what they have to contribute of value to the person or to the company in a position to give them a job that will bring in a certain amount of return. Anyone who is interested in the fine arts end of ceramics, necessarily a broader field than just pottery, will be interested in the organization which we have effected at Schenley Park. We have not been in a position to do very much advertising; we do not run our courses as a moneymaking proposition and, therefore, although we have grown very rapidly, we are not so well known outside of Pittsburgh and Western Pennsylvania as we would like to be, and as I think we deserve to be.

C. DRESSLER:—I should like to ask Mr. Ellis whether he is training people especially for the architectural work in connection with the fine art work, the subject which was last discussed?

J. B. ELLIS:—One of the departments, the architectural department, in its curriculum, has a certain amount of architectural modeling, and also includes students going into the Department of Sculpture and working out certain problems in clay. When we have sufficient faculty available, we shall be able to enlarge that work, so that they cannot only model the clay but do it with the idea that if the thing works out successfully, it can be fired and glazed.

W. D. GATES:—In Chicago there is now formed the Society of Arts and Industries, and they are planning the erection of quite a large addition to the museum and have it run under the Art Institute, for training in different lines in connection with the industries, and training young men and young women in the line of all these different industries. Considerable progress has already been made toward the fund for putting up this building.

A NOTE ON THE REQUIREMENTS OF SAGGER BODIES

By M. F. Beecher

In discussing the possible improvements in the quality of saggers it seems well to inquire first into the common causes for failure, and then to consider how and to what extent those causes may be eliminated. In making such an inquiry it would be advisable to separate those due to the character of the raw material from those due to the process of manufacture, to allow more careful study of each factor. This note will present some comments pertaining to the raw materials.

The materials of which a sagger is made are probably deserving of first

attention. In the past, clay has been almost universally used, but of late years newer and more refractory materials have been receiving study by manufacturers. And it should be had in mind that perhaps some of these new materials have properties other than simply greater refractoriness that might particularly commend them for sagger use. (By refractoriness is here meant, ability to remain rigid under normal load, under the influence of heat).

The first requirement of a good sagger is that it remain rigid at furnace temperatures (refractoriness). Lack of rigidity may be evidenced by softening (chemical failure) or by rupture in shear, tension or compression (mechanical failure). Chemical failure is due essentially to the character of the constituent materials resulting in low fusibility. Mechanical failure may be due to an insufficient amount of the bonding constituent, to volume changes taking place during use because of changes in crystalline structure, to diffusion of slags or to other causes. Since mechanical failures may readily arise from chemical changes within, or reaction between the constituent materials, no sharp line of demarcation can be drawn.

The other principal requirement is that it have good mechanical strength at room temperature, both originally and after continued service. Original high mechanical strength can be easily obtained, by the use of a strong bond in sufficient amount. The retention of that strength with continued use is a function of the material used and is the principal unsolved problem in this connection. In fact this is the really big problem in connection with sagger materials and mixtures. The means are at hand whereby selection of materials of suitable refractoriness may be made, and sufficient data are available to serve as a guide in their proper proportioning so that saggers originally strong at room temperature and mechanically rigid in the furnace can readily be made. Present practice readily demonstrates this. Service tests almost invariably disclose that every piece remains intact during the first three or four burns and then losses by breakage begin and continue at a more or less rapid rate. This means that the saggers were originally strong at room temperature and were chemically and mechanically rigid in the kiln, but after a few firings begin to weaken so that they are cracked or broken when drawn from the kiln or fall apart in ordinary handling.

The factors or properties which seem to be most involved in this deterioration are coefficient of expansion, modulus of elasticity, thermal conductivity and mechanical strength.

If sagger bodies did not expand and contract when heated and cooled the sagger problem would be a simple one. The expansion and contraction is in no case uniform throughout the piece for in no case is the sagger heated uniformly. Other conditions being equal then, that body which has the highest thermal conductivity will be under the least internal stress because

the temperature differential will be smallest. Also that body having the lowest coefficient of expansion will have the least internal stress because it will be under the smallest internal strain. Again, that body having the lowest modulus of elasticity will be under the smallest internal stress, for other things being equal, a given temperature differential would produce a given amount of strain. Obviously, that body having the highest mechanical strength in the kiln will remain unbroken the longest, when subjected repeatedly to this differential expansion and contraction.

The mechanical effect of this differential expansion and contraction is to produce fine cracks throughout the structure. These partially relieve the strain produced, but result obviously in a mechanical weakening of the piece. Since the mechanical strength decreases with the development of these cracks, the deterioration from this cause will continue from burn to burn. It is apparent then that the best sagger body is that one which develops these fine cracks at the slowest rate and that will be the body which has high thermal conductivity, low coefficient of expansion, low modulus of elasticity and high mechanical strength.

Before very substantial progress can be made, more data of this character on the available refractory materials are necessary. Silicon carbide and fused alumina have given indication of long life as saggers. The coefficient of thermal conductivity is high, being about 10 and 5 times respectively that of fire clay. Their moduli of rupture are high also in comparison and their coefficient of thermal expansion somewhat lower. Data on modulus of elasticity are lacking but they probably have no advantage over clay in this particular.

With a more careful study of these four properties of available sagger materials it is safe to say that much more durable and economical saggers can be produced than have ever been made before.

Norton Company
Worcester, Mass.

SAGGER COLLOQUIUM[1]

Led by W. A. Hull

W. A. Hull:—Mr. Pence, as Chairman of this Division, has in mind a program of coöperative research on sagger problems.

F. K. Pence:—Any attempt on my part to offer data at this time is premature. The Bureau of Standards is conducting an investigation on this subject in coöperation with certain manufacturers, particularly those of the U. S. Potters Association, but these investigations are not far enough along to give data.

The sagger problem naturally divides into two phases: the first being the behavior of the sagger in the raw state, and the second, the behavior

[1] Whitewares Division, Pittsburgh, Pa., February, 1923.

in use. In order that we may have a workable body in the raw state, the materials must possess satisfactory strength and drying properties. For this, modulus of rupture tests are being made on standard bars. In spite of the fact that considerable work has been done, we have failed to determine exactly what properties are required in the clays for saggers. The outlining of investigations to determine these properties is, in part, the task of the Research Committee of the Whitewares Division. I shall state very briefly the line of attack we have in mind.

All other considerations aside, we should probably select those clays which have the greatest strength in raw state. To determine this strength a standard test bar 6 inches long and one square inch cross-section is made and tested when dried. In the forming of these test bars care is taken that there are no laminations, cracks or molding faults. It may be formed by rolling in the hands, placed firmly into a brass mold having a movable bottom, the surplus clay cut off with a fine wire and the bar then removed carefully and air-dried for three or four days; and finally dried at 105° to 110°C. It is then placed in a dessicator and tested moisture free.

The other observations on the raw clay are (1) drying shrinkage and (2) the sticky quality.

A close sticky clay may dry with great difficulty no matter what the shrinkage. Black sticky clays are of that nature. A clay with low drying shrinkage is desired. Usually the clay of greatest strength has the greatest drying shrinkage.

Having the modulus of rupture in the raw state the next test is the fire shrinkage. This shrinkage is important.

The sagger should be of the highest mechanical strength when fired to withstand the breaking strains in handling and the load strains in use. Frequently high mechanical strength is obtained only at the expense of ability to withstand rapid temperature changes. As a rule the more porous saggers will best withstand temperature changes, hence it is that for some purposes either strength or porosity must be sacrificed and in all cases a workable balance obtained. We cannot have maximum strength with maximum resistance to breaking due to sudden temperature changes.

The general ware industries have found that an absorption of 14% to 15% was most satisfactory. This would not be suitable for all industries. It was determined that 14% or 15% absorption gives a body fairly open and yet of sufficient mechanical strength.

The Bureau of Standards will make porosity and strength tests. Such data should be correlated with modulus of rupture on standard bars made of the clays.

We want to be able to say that a sagger for a given purpose must have a certain mechanical strength and that if a sagger in question does not have this strength the chances are that it will not serve.

The control of firing shrinkage by the amount of grog and the resultant effect on strength is important. What is the effect of 40% grog as against 50%? We must use grog and yet we cannot overload the bond clay with it. Forty per cent or more grog is quite usual for general ware. At first I was of the belief that this was too much grog. When more grog is used than the bond clay can carry the saggers will not stand up; they will settle under load. This could not be allowed in the case of pin saggers for the alignment of the pin holes must be maintained.

Is the size or the range in size of the grog of importance? Can we use coarser grog in case we use less?

It may be difficult to lay down absolutely a rule for any of the white wares industries, but for given conditions of load and heat treatment *I am sure* that rather definite and useful data can be obtained.

We shall work out a questionnaire in the Bureau of Standards regarding the working properties of clays in the raw state including such properties as strength, drying shrinkage and the amount of grog that each can carry, the mechanical strength fired as determined by modulus of rupture on standard bars, the effect of repeated heat treatment as perhaps indicated by firing test bars repeatedly and testing, and resistance to sudden change of temperatures.

Recently I saw a rig to determine the resistance of spark plugs to sudden temperature changes. They revolved the carrier over a flame thus subjecting the plugs to alternate high and low temperatures. The number of revolutions were recorded and from this the number of alternate heating and cooling which each plug sustained before cracking was known. Some such tests would give valuable data on saggers.

The Bureau of Standards is in a position to determine the properties of sagger clays at different firing temperatures. They have such data for ball clays. A study of the vitrification range of sagger clays is important as was shown in Purdy's original work in Illinois on paving brick clays.[1]

The object of this colloquium is to obtain the largest possible coöperation in investigation of saggers and sagger materials.

W. A. Hull:—There is no question but that Mr. Pence is an optimist as to what we are going to do this year, but there are some of the potters who are already doing parts of this work which Mr. Pence has suggested. Some of the potters are testing their own clays. Some may be doing work on the properties of sagger mixtures, and perhaps making tests that Mr. Pence has suggested. The Bureau of Standards would be glad to get in touch and compare notes with as many of such laboratories as care to do this.

In work of this sort, a certain amount of effort will be lost, not so much

[1] R. C. Purdy "Paving Brick and Paving Brick Clays of Illinois," *Bull.* 9, Ill. State Geol. Surv. (1908).

due to overlapping as to the fact that one investigator will run against snags that perhaps some other investigator has already found a way around. If a number of factory laboratories will do such work as they can along lines that Mr. Pence has suggested and such other lines that may suggest themselves, and will pool results through the Bureau, all who thus participate will profit. We have given publicity to the fact that we are working on these problems and have sent out for material. Some offices have a follow-up system apparently and want to know soon if there are any results. The more laboratories working on this subject the fewer inquiries we are going to have to answer at the Bureau of Standards. The term "Bureau of Standards" is used as an all-comprehensive term which indicates an enormous capacity for work. When we started on this sagger investigation we looked for a year and a half before we found one man suitable to put on it. Now we hope to have funds enough to give that one man some assistance.

As Mr. Pence has already stated, there are two things we have to consider. (1) The properties of the materials that go into the saggers (2) the properties of the finished saggers. The refractories people are charting the conditions to be met by refractories in use. By thus listing the properties required they will determine the suitability of refractories for specific purposes. If the properties needed in a sagger are known, we then have an intelligent basis on which to search for the required materials with which to fabricate and the method of fabricating to get the best results.

A. V. Bleininger:—Messrs. Pence and Hull have already covered the subject of tests so thoroughly and comprehensively that there is very little to add. I shall refer, however, to the mode of preparation. I have always been impressed by the fact that if a man was instructed to devise the very poorest method of mixing and preparing a sagger mix, he would probably hit upon the way in which most potters are doing it. The old time-honored soakpit and the system under which it is operated, the method of incorporating the grog, the method of operating the pug mill, which is easily the worst piece of apparatus on the plant, all contribute to the fact that the resulting product is bound to be of uncertain quality. Frequently I wander through a sagger shop and examine the prepared material ready for use and note the lack of homogeneity in the sagger body.

I believe that making of good saggers is intimately associated with proper preparation. This, we all agree is a thing in which we must bring about a profound change if we are to get better results. This is one thought we must keep in mind.

We must realize also that the laboratory tests involve methods of preparation which are very much better than those in actual use and hence the results must be judged accordingly.

I should like to second the Chairman's suggestion that we study the resistance of sagger bodies to thermal shock. The Refractories Committee of the American Society for Testing Materials has already attacked this problem.

One other suggestion is that we determine the after-shrinkage of the prepared sagger body subsequent to the first firing. This is a very important fact, because if you have a sagger body which contracts in use under load imposed on it, it is evident that you are subjecting the sagger to a very heavy stress. Hence it is important that the after-shrinkage be reduced to the minimum. I believe we have here the keynote of a vital point not heretofore considered.

It is not so much the initial shrinkage we desire to know but the after-shrinkage in the second, third, fourth and fifth fires. This should be followed up with considerable care.

H. Goodwin:—We all realize that saggers are an important problem and that they will be important as long as we are in the business. At St. Louis last year we had this under discussion[1] and it was agreed that certain lines should be followed. I am somewhat disappointed that we do not have further data to be presented at this meeting. I fully realize and agree with all that has been said. We are working in the dark with the sagger problem. It is just as necessary for the sagger mixture to be right as the body. Can anyone tell results obtained last year at St. Louis, when a motion was made that the Society take up the matter with the United States Potters Association and the Bureau of Standards.

A. V. Bleininger:—This matter was not neglected. It was taken up and duly presented to the U. S. Potters Association and they have responded to this and to other suggestions by appointing a research committee. Your Chairman is a member of that Committee. The proposed sagger investigation was discussed quite fully and we came to the conclusion that we must first secure all of the preliminary information possible. Before making an appropriation of the magnitude mentioned, preliminary studies are needed.

There is available a rather large amount of information which should be gathered together before much money is spent. The U. S. Potters Association is making a study of this field and will be ready to coöperate with this Society as soon as the situation has been clarified. There are a number of aspects of this important problem that must be considered carefully.

W. A. Hull:—Has anybody any standards on the strengths or moduli of rupture of sagger mixtures? Someone may have determined this from his own experience. Mr. Bleininger, how strong should the three types be?

[1] See C. C. Treischel, "Coöperative Research on Sagger Mixtures and Manufacture" and Discussion, *Bull. Amer. Ceram. Soc.*, 1 [7], 101–6(1922).

A. V. BLEININGER:—I could only make a guess, but we can give you definite information along these lines from our records. We should be glad to give you the figures we have obtained at our plant and Mr. Pence would do likewise. In addition, Mr. Pence has conducted for our Research Committee a series of tests which he will report in the near future. I think I can speak for most of the pottery companies that they would be glad to assist in every way.

W. A. HULL:—We do not want to write to all the pottery companies and ask them individually, but I assure you they would be welcome.

A. V. BLEININGER:—The Research Committee of the U. S. Potters Association will be glad to furnish all the information it can.

W. A. HULL:—That is the proper channel. As already more or less advertised, the Bureau is undertaking to do some work along the lines of the sagger problems but we cannot do much more than make a beginning in a year. We have requested manufacturers to send in samples of the clays they are using. The plan was to make a survey of the properties of the important types of sagger clays now in use as a basis from which to plan a systematic investigation, very much along the lines which Mr. Pence has indicated. We have determined some of the properties of fifty-five clays. Those will undoubtedly resolve themselves into groups of clays with similar properties. Then we propose to make mixtures in the laboratory duplicating as nearly as possible some of the successful mixtures that are in use so that we can obtain data on measurable properties of these factory-tried mixtures, thus having a basis for comparing laboratory saggers with factory-made saggers.

We then propose to make some mixtures of our typical clays and compare their properties with those of mixtures in use.

As means of studying the progressive changes that go on in successive burns that the sagger goes through, we are going to ask some of the potteries to fire test bars made in the Bureau of Standards under conditions that admit the least effect of the personal factor in the preparation of the specimens. From each successive firing, test bars of each sagger mix will be sent back to the laboratory to be examined and tested. We can thus find what develops from the repeated firings. I do not think there is any question in anybody's mind but what the sagger deteriorates in some way due to its repeated heating and cooling. We believe that the kind of deterioration, the nature of the change and the extent of it, depends on the nature of the mix and in the kind of firing to which it is subjected.

What investigations have been made have been for the most part with a view to getting results rather than getting explanations and the Bureau of Standards particularly should be able to go a step further.

It is readily understood that the undertaking of this investigation be-

ginning with the clays themselves and following with different mixtures of clay and grog is a big job. I wish to speak for the investigators your coöperation and your patience.

M. R. HORNUNG:—The biscuit sagger carries a heavier load than that on the bottom whereas the glost sagger carries a lighter load oftentimes on pins projecting from the sides of the saggers. The glost sagger which carries only a few pieces of hollow ware on the bottom certainly ought to require a different sort of sagger than that for the biscuit.

We have made saggers out of fine grog and it is surprising how they have lasted. But it is hard to dry them. They must be thoroughly dried before firing.

The machine-made saggers differ from the hand-made. For equal service results, the properties of the saggers by these two methods differ a great deal.

G. E. SLADEK:—We use a 50% grog body for our machine saggers and we seem to have fair luck with them. We have had our share of friable saggers, and we also have a little trouble with glost saggers.

When we first started to fire coal in our periodic kilns, the wads stuck. This difficulty was eliminated by a slight change in the design of our fire box, by which oxidizing conditions were obtained. This seemed to have a marked effect on the life of the saggers. We have had very good luck, however, for three years.

Another point is that we keep account of the number of saggers broken in handling and the number coming out of the kiln broken. The average is three broken on drawing for one broken in the handling.

W. A. HULL:—Does anyone want to contribute from his experience in the casting of saggers?

A. V. BLEININGER:—Some cast saggers were made at our East End Pottery. There is promise of improved quality but from the standpoint of cost our experience so far is not promising. Our general superintendent, Mr. Walker, has studied the subject but what information he has obtained indicates that the process would be more expensive. Also the question of room was a serious one, where all the space is taken up already by manufacturing processes. Some work in this connection has been done by the Mount Clemens Pottery Company. Similar work has also been done by Mr. Brain of the Standard Sanitary Manufacturing Company. They have had good success with the cast saggers.

The casting itself is promising from the standpoint of quality but there are other questions coming in. If you begin to figure on the number of molds required I think you would get rather astonishing figures.

H. GOODWIN:—The question of kind and percentage of grog has been brought up. Frequently factories run short of biscuit grog and have to resort to broken glost saggers. A successful manufacturer told me that

he calcined sagger clay, so much of it in each kiln to maintain the quality of his grog. I have found that very successful. The use of glost saggers for grog will bring trouble. The size and quality of grog must be under control if we are to make saggers of the greatest mechanical strength.

T. A. KLINEFELTER:—We have not been casting saggers long enough, nor in sufficient quantities to get well-analyzed or the lowest costs, but at present they are costing between two to four times the ordinary saggers. While I cannot give definite data on the life of cast saggers there is a general understanding that they are lasting twice as long.

Cast saggers come straighter and you can pick them out from the rest. I attribute the straightness to the more thorough mixture. There have been papers read in the Terra Cotta Section about making tile, which is exactly the same proposition, in which was brought out the fact that good mixing and proper pressing was often more effective in producing good quality tile than was the selection of clay.

F. K. PENCE:—At Zanesville we came practically to the same conclusion. The cast sagger was very satisfactory but with proper mixing the plastic sagger was made nearly as good.

A MEMBER:—In New England they still use the old wheel chaser. At one time they thought that method was antique. They installed a wet pan but it failed completely. They then went back to the wheel chaser. This is an old-fashioned device; a big cart wheel on a ratchet that causes the wheel to travel from the center to the outside of the pan. The clay and grog is soaked overnight. This procedure gives a very homogeneous product.

H. GOODWIN:—If I can be of any service to Mr. Hull, and he wants anything from me, I shall be glad to send it to him.

A. S. WATTS:—The following data is taken from a thesis by D. M. McCann.

Ingredients	
No. 5 Fire Clay (Lower Kittaning)	Fuses Cone 32–33
X Wad Clay (Tennessee)	Fuses Cone 28
Ball Clay (Hazel, Ky.)	Fuses Cone 31
Grog (4- to 16-mesh)	Fuses Cone 31

Clays ground to pass 20-mesh sieve.

All mixtures soaked 24 hours, put through pug mill 3 times, then soaked 24 hours and pressed in steel die. The trial pieces were solid cylinders 6 inches long and 7 square inches across sectional area. They were fired to cone 2 and then sent to the Mosaic Tile Company, Zanesville, Ohio, where they were fired at cone 10. One third of each set was fired at cone 10, once, another third was fired at cone 10 five times and the third set was fired at cone 10 ten times.

The best body had a composition of 20% ball, 7½% wad and 22½% first class fire clay, 50% grog. The second best had a composition 27½% sagger ball clay, 22½% fire clay, and 50% grog. The general conclusions found from this study were that ball clay weakens in excess of 25% while the fire clay and wad clay have about the same

strength. Additional fire clay increases the strength up to 22½% when mixed with ball clay. There is a slightly increased strength with the addition of wad clay. We found better saggers with the fire clay, ball clay and wad clay mixture than with ball clay and wad clay or ball clay and fire clay. The values vary from 300 pounds to the square inch to 1100 pounds to the square inch. Some manufacturers have sagger mixtures very similar to No. 7.

	Composition				Crushing Strength of Trial		
No.	Ball	Wad	Sagger	Grog	Load test 1 burn lbs.	1330°C 5 burns lbs.	10 burns lbs.
1	20	30	..	50	7000	6200	6100
2	20	22.5	7.5	50	6666	6500	6320
3	27.5	22.5	..	50	3930	3950	3920
4	20	15	15	50	6950	6950	6860
5	27.5	15	7.5	50	7400	6265	6100
6	35	15	..	50	6450	5100	5000
7	20	7.5	22.5	50	8000	7500	7000
8	27.5	7.5	15.0	50	4300	4100	3720
9	35	7.5	7.5	50	7000	6830	6450
10	42.5	7.5	..	50	1950	1620	1820
11	20	..	30	50	4550	1580	4550
12	27.5	..	22.5	50	8000	7500	6400
13	35	..	15	50	5500	3200	3100
14	42.5	..	7.5	50	1900	2050	1680
15	50	..	..	50	2020	2000	2000

H. Goodwin:—Years ago I made several tests using New Jersey clays with 20% fire clay, with good results, although fire clay is not extensively used. Prof. Watts' report bears out my experience.

W. A. Hull:—Is that not more generally done because fire clays are not used in potteries?

H. Goodwin:—Most factories keep a small stock of fire clay for the repairing of kilns. We always keep it on hand and I do not know why we have not used it more extensively. During the years 1920 and 1921 we had about 6% fire clay in our sagger mix.

W. A. Hull:—Is the strength of the dried mixture an index of the strength of the burned mixture and is there any relation between the two? Has anybody ever tried a sagger mixture more refractory than necessary and burned at a higher temperature? Has anybody tried burning saggers the same as for refractories?

H. Wilson:—Our experience might be strange to some here. I found we could increase the life of saggers 50% by reducing the first heat. We first fire at a lower temperature thus, we believe, adding to the life of the sagger. That is contrary to Mr. Bleininger's experience.

W. A. Hull:—Where do you burn them?

H. Wilson:—We burn a kiln of saggers at about cone 8, while cone 12 is the heat in which they are used.

H. Goodwin:—Relative to the life of a sagger first fired at a lower

temperature my experience has been that such saggers when used in glost kilns give considerable trouble due to new saggers being larger. No matter how carefully the wad has been put on it will shrink away leaving a fissure from $^1/_8$ to $^1/_4$ inch. There is also the added danger of the bungs collapsing due not only to the saggers being of different sizes, but to the fact that the new saggers burned at a lower temperature cannot carry the weight of a bung of loaded saggers. It may be all right with you, yet it is a dangerous practice.

W. J. Thrower:—I will have to agree with Mr. Wilson with regard to the firing of green saggers to a heat below that at which they are used. For a period of 18 months we have been firing our green saggers at about cone 5 or less. This materially increases the life of saggers.

That idea was given to me by a very old kiln fireman. He could not present an argument to justify it. He knew it. We tried it and have never quit it. From our experience I will agree it works satisfactorily.

There is no question but that one of the greatest things today in the making of saggers is the preparation of the clay. During the war everybody let down on quality. The men would put the clay into our soaking pits 15 inches thick. They would put the allowance of grog on that and then 14 inches more of clay. There was a loss of about 50% in the saggers. We then made each layer only 6 inches thick. Any clay in lumps had to be broken up or partly pulverized. On that 6 inches of clay was put its quota of grog. Thus the pit was built up until we got eight layers instead of three. Instead of having a 50% loss, it ran around 8 or 9%. There was no change in sagger clay. It is a question of the proper mixing of clay. I should like to ask Mr. Bleininger if he used the same mix as is generally used.

A. V. Bleininger:—I think the regular mixture was used except it may have been somewhat finer grog.

W. J. Thrower:—We should devise some means of crushing so we can mix the clays before putting them into the pit, if we still use the pit.

H. Spurrier:—Two points occur to me. The amount of water used in tempering the mix is a matter of importance and the drying also is another point of considerable importance. If you conceive of a sagger mix as merely a body cemented together, your grog does not lack in size or shape, whereas your clays do and you have to consider that you have a body cemented together. It is delicate.

Some have maintained that if saggers were dried in a drier the life would be increased. I have never seen saggers dried with such care but I am quite ready to believe it would add to the life of the sagger. Moreover I do believe the saggers are handled far too rough'y. They are delicate prior to the firing.

A. S. Watts:—A client of mine used four kinds of sagger. These,

previously finely crushed, were shoveled with 4- to 16-mesh grog into a brick machine equipped with a nozzle that gave a 6-inch square column of stiff mud consistency. The grogged mix thus pugged was piled and allowed to age for three weeks covered with wet burlap. Saggers were made by the ordinary hand pressing.

They thought it was not necessary to crush the material so fine, so after the first batch of 160 saggers, they made another lot with coarser clay and pan run of grog. Saggers thus made failed whereas the manager said the first lot of saggers lasted until they were "ashamed of them."

F. CERMAK:—We have mixed clay for 8 years at the General Electric Company in an 8-foot pan. We make a batch of 600 pounds which runs from 8 to 10 minutes. We do not use a soak pit.

A. S. WATTS:—About firing saggers: the most severe treatment green saggers receive is in the original burning. In a stack of green saggers, twelve high, the one on the bottom is drying and firing under an enormous load. Then we wonder why they do not come out strong. The saggers burned on the top of the kiln, two or three on a bung are the best. If, when it is necessary to boost the production of the saggers, the green saggers are stacked five or six high the result is inferior saggers. They are unduly strained.

W. A. HULL:—We started out with a misconception of the situation, stating sagger troubles, and it looks as though all we have to do is to make saggers the best we know how. Nobody appears to be doing it. What is the use of an investigation if we know about it all the time and let our bad practices go on?

The problems of proper choice of materials, their compounding and burning are being investigated by the Bureau of Standards. The Research Committee of the U. S. Potters Association is collaborating and it is the purpose of the Research Committee of the White Wares Division of this AMERICAN CERAMIC SOCIETY to participate in this work.

SERVICE CLASSIFICATION OF FIRE BRICK

Committee C-8 on Refractories of the American Society for Testing of Materials has adopted a scheme looking toward a service classification for refractories. At the present there is a classification based on fusibility in grades 1, 2, 3, and 4 but this has been without value to either the producer or consumer. By this new classification based as it is on the properties required to meet service conditions, the service rather than the bricks will be classified and numbered and be the basis on which specifications will be written. All bricks which possess the properties required to meet a given service will be known according to the service it will render. Ser-

vice rather than bricks being thus classified, a given brick may serve in as many classifications as tests and service will prove it to claim.

The complete report of the committee follows.

Policy of Committee C-8

This special Committee has given a great deal of thought to the matter of formulating a definite policy for the work of Committee C-8, and as a result of its work, makes the following proposal:

In order that Committee C-8 should function most efficiently, so that it may be of the greatest service to both the producers and users of refractories it is felt that the present plan of organization should be revised and that a new form of organization should be set up in which the Chairman should be relieved of the responsibility and detailed work of the Sub-committees and that this responsibility should be vested in a coördinating Committee which in the proposed By-laws is called an Advisory Board composed equally of producers and consumers. This form of organization is set forth in the proposed By-laws at the beginning of this report.

With this new form of organization the work of the Committee should proceed along the following lines:

(*a*) The formulation of a Service Classification of Refractories. This has been undertaken by your Committee and is made a part of this report.

(*b*) An Industrial Survey of furnaces and furnace conditions in accordance with this Service Classification. This work is to be taken up by the Sub-committee on Industrial Survey.

(*c*) The definition and interpretation and further development of the tests. A proposed Sub-committee on Tests and Specifications will undertake this work.

(*d*) The preparation of specifications. This work will be done by a Sub-committee on Tests and Specifications in coöperation with the Sub-committee on Industrial Survey both working together under the Advisory Board.

In the matter of drawing specifications, the Committee proposed that it shall be the policy of Committee C-8 to draw specifications only for general classes of refractories for which there is a commercial demand and not to draw specifications for special isolated requirements.

In order that the work of the Sub-committee on Tests and Specifications through its section may go forward with maximum efficiency and coördination, it is recommended that each section should adopt the same method of attack.

(*a*) That the first step should be the preparation of clear cut definitions of the property that the section is studying.

(*b*) That a careful study should be made of the various tests with a view to developing limitations and the proper interpretations of their results.

(*c*) That special attention should be given to the adaptation of each test to its use in specifications and that further developments should be immediately studied. Many of our present tests are not adapted in their present form to application in commercial specifications.

Service Classification

This special Committee has felt that one of the most important pieces of work it had to perform was to formulate a classification for refractories based on service conditions. It believes that in the final analysis it is service that the consumer purchases and that no method of classifying refractories could be satisfactory that is not based upon this principle.

SERVICE CLASSIFICATION OF REFRACTORIES			LOAD								
			UNIMPORTANT			MODERATE			IMPORTANT		
			ABRASION UNIMPORTANT	ABRASION MODERATE	ABRASION IMPORTANT	ABRASION UNIMPORTANT	ABRASION MODERATE	ABRASION IMPORTANT	ABRASION UNIMPORTANT	ABRASION MODERATE	ABRASION IMPORTANT
SLAG ACTION	UNIMPORTANT	SPALLING UNIMPORTANT	1	2	3	4	5	6	7	8	9
		SPALLING MODERATE	10	11	12	13	14	15	16	17	18
		SPALLING IMPORTANT	19	20	21	22	23	24	25	26	27
	MODERATE	SPALLING UNIMPORTANT	28	29	30	31	32	33	34	35	36
		SPALLING MODERATE	37	38	39	40	41	42	43	44	45
		SPALLING IMPORTANT	46	47	48	49	50	51	52	53	54
	IMPORTANT	SPALLING UNIMPORTANT	55	56	57	58	59	60	61	62	63
		SPALLING MODERATE	64	65	66	67	68	69	70	71	72
		SPALLING IMPORTANT	73	74	75	76	77	78	79	80	81

Temperature indicated by prefixing proper letter to number.
H = High Temperature
M = Moderate "
L = Low "

Example: M-21 indicates moderate temperature, unimportant load, unimportant slag action, abrasion and spalling both important.

FIG. 1.

A number of modifications of the idea have been proposed and examined. Several plans, while they had the merit of being concise, were open to certain objections in that they involved assumptions regarding the mutual dependence of certain properties. The final basic classification chosen by the Committee as being its opinion free from such objections is shown in Fig. 1, attached herewith.

This classification involves five fundamental qualities, *viz.*, tempera-

ture, load, abrasion, slagging and spalling, and has assumed that there may be three degrees of resistance required for each quality, *viz.*, unimportant, moderate and important. Such a classification as given in the diagram results in eighty-one possible classes. It is believed that the classification is sufficiently comprehensive to cover all possible requirements and should, therefore, be free from objections which would have been raised to some of the more concise forms previously mentioned.

On studying this comprehensive scheme, the Committee was struck by our present meagre knowledge of the requirements for many of these classes and it was believed, for the present at least, that it would be better to commence our work on a simpler scheme of classification that should be so chosen as to be capable of expansion, at any time should the demand arise, into a more comprehensive form. The Committee believes it has accomplished this simplification by using a comprehensive scheme as a foundation, and by choosing for our preliminary form the four classes taken at each corner of the main structure. These are indicated in the plate by the crossed hatched squares (Fig. 1). It will be noted that this is simply omitting for the present, one of the degrees of variation in each of the fundamental qualities, *i. e.*, the moderate degree.

CLASS H, M, OR L	TEMPERATURE	ABRASION	LOAD	SPALLING	SLAG
1	Yes				
3	"	Yes			
7	"		Yes		
9	"	Yes	"		
19	"			Yes	
21	"	Yes		"	
25	"		Yes	"	
27	"	Yes	"	"	
55	"				Yes
57	"	Yes			"
61	"		Yes		"
63	"	Yes	"		"
73	"			Yes	"
75	"	Yes		"	"
79	"		Yes	"	"
81	"	Yes	"	"	"

FIG. 2.—Summary of tests required.

This simplified scheme, then, gives only 16 classes, which it is believed will be ample for our present purpose; and yet these 16 classes are so chosen that, should the demand arise in the future, the further extension may be readily inserted without destroying the work that has already been done. By adopting this scheme, the work will be brought to within a reasonable compass in view of our present knowledge of furnace conditions and requirements.

In Fig. 2 herewith is given a summary of the test requirements for the different classes of service in accordance with this scheme of service classification. It will be noted that the test requirements for Class 1, for instance, are merely that of temperature, whether it be high, medium or low. These

test requirements increase to five in Class 81 which would have a requirement for temperature, abrasion, load, spalling and slagging. This second diagram should be of great importance in directing the work of the proposed sub-committee on tests and specifications. It indicates that at the present time we are only in a position to write specifications for Classes 1, 7, 19 and 25 and as a matter of fact, our existing load test and spalling test will both require revision to adapt them to use in specification. This summary also points out the necessity for immediate work in developing a suitable test for abrasion and slagging.

It is believed that the proposed by-laws will cover many of the situations which have handicapped Committee C-8 in its work in the past. The proposed scheme of organization will relieve the Chairman of the immediate responsibility for the work of the sub-committees and place this responsibility on the Advisory Board. Our past experience has indicated

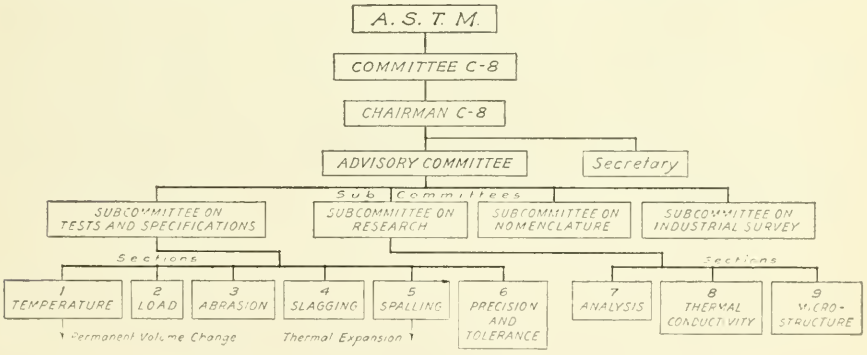


FIG. 3—Proposed organization Chart of Committee C-8.

that this will be a desirable form of administration. Under these By-laws, the organization of the Committee will be in accordance with the organization chart attached to this report.

Under the Chairman will be the Advisory Board, and under the Advisory Board will be the four standing Sub-committees, *viz.*, Tests and Specifications, Research, Nomenclature, and Industrial Survey.

The Sub-committee on Tests and Specifications will have as required under the proposed service classification, sections on Temperature, Load, Abrasion, Slagging and Spalling, which are the standard tests and in addition a section on Precision and Tolerance which will, as in the past, continue to make a critical study of the results obtained by the various proposed methods. This Sub-committee will be charged with the development of Standard Tests and Standard Specifications.

The Sub-committee on Research will consider all of those subjects which at the present time are not immediately applicable to specifications

so that at present it would have sections handling Chemical Analysis, Thermal Conductivity, and Micro Structure. This Sub-committee would automatically handle any new method of testing or investigation. The Research Sub-committee would also be available to assist any of the sections of the Sub-committee on Tests and Specifications.

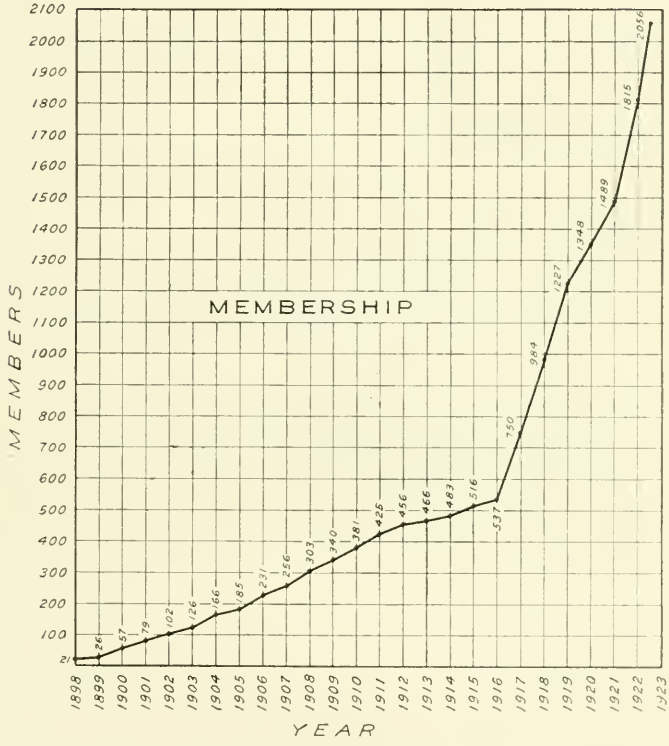
The Sub-committee on Nomenclature is more or less a formal Committee appointed at the request of the Society to coördinate the work of Committee E-8 on Nomenclature with the work of the Standing Committees.

The Sub-committee on Industrial Survey will report on the classification of furnaces and furnace conditions in accordance with the standard form of service classification presented in this report. This Sub-committee, of course, will coöperate under the Advisory Board with the Sub-Committee on Tests and Specifications.

It will be noted that the present form of organization has eliminated several of our present Sub-committees. Their work will be merged with certain of the sections of the Sub-committee on Tests and Specifications; for example, the work on Permanent Volume Change will be handled by the Section on Temperature, and Thermal Conductivity will be handled by the Section on Spalling. The present special Committee on Magnesite will be discontinued as the proposed scheme of service classification does not require such sub-division.

ACTIVITIES OF THE SOCIETY

WE HAVE MORE HORSE POWER BUT NO MORE SPEED—WHY?



Twenty personal and six corporations is our June 15 to July 14 record of acquisitions. Growth in membership is shown here graphically.

NEW MEMBERS RECEIVED FROM JUNE 15 TO JULY 14

PERSONAL

Campbell, Thomas, Wunderlich Ltd., Box 474, Sydney, New South Wales, Australia, Works Manager.

Cartwright, George, P. O. Box 2, Darby, Pa., Proprietor, Darby Fire Brick Co.

Decker, William More, Jr., 32 St. James Pl., Buffalo, N. Y., Secy.-Treas., Hygeia Glass Corp., Lancaster, N. Y.

Gevy, Addison H., Glen-Gevy Shale Brick Co., Shoemakersville, Pa., Superintendent.

Greenlee, Fred W., Linerville, Ia., Student.

Hysell, Eugene J., Buckeye Tile Co., Chillicothe, Ohio, Vice-President and Manager.

Lunn, C. A., Consolidated Gas Co., of New York, 130 E. 15th St., New York City, Chief Chemist.

Menart, E. G., 67 Neal Ave., Newark, Ohio, Enameling Superintendent, The Wehrle Co.

Miller, C. F., c/o Root Glass Co., Terre Haute, Ind., Chemist.
Nyar, Mulkh Raj, Box 43, W. Lafayette, Ind.
Owen, Thomas Wilfred, 1104 145th St., East Chicago, Ind.
Rice, William E., 42 Rice St., Alliance, Ohio, Fuel Section, U. S. Bureau of Mines, Car Manager, Laboratory Car "Holmes."
Sanborn, Paul H., Chemist, Jeffery-Dewitt Insulator Co., Kenova, W. Va.
Seiler, Carl, 860 Drexel Bldg., Philadelphia, Pa., Representative of the Roessler and Hasslacher Chemical Co.
Scott, W. J., Room 141, Industrial Bldg., Bur. Standards, Washington, D. C., Junior Engineer, Ceramic Division.
Serpa, Frank, Rehoboth, Mass., Superintendent, Enameling Plant, Rehoboth Enameling Co.
Stephenson, W. S., 1321 Widener Bldg., Philadelphia, Pa., District Manager, The American Rolling Mill Co.
Suit, Harry Franklin, 214–12th St., N. W., Washington, D. C., Plating and Polishing.
Turk, Richard, 116 W. Hamilton Ave., Hamilton, Md., Porcelain Enamel and Mfg. Co.
Wilcox, Bernard, c/o Smith and Stone Electrical, Georgetown, Ontario, Foreman.

CORPORATION

Bryce Brothers Co., Glass Mfrs., Mt. Pleasant, Pa., G. S. Bryce, Treas. and Gen. Mgr.
The Electro-Alloys Co., Taylor St., Elyria, Ohio, J. B. Thomas, Treas.
A. D. Poclim & Co., Ltd., Salford, Manchester, England, David T. Taylor, Director.
The Roseville Pottery Co., Zanesville, Ohio., Russell T. Young.
United States Sanitary Mfg. Co., 1707 Arrott Bldg., Pittsburgh, Pa., A. H. Cline, Jr., Secy.
Peoples' Gas Light and Coke Co., 122 S. Michigan Ave., Chicago, Ill. H. H. Clark, Fuel Engineer.

The members who are actively engaged in securing new applications for membership are shown in the following list:

Name	Personal	Corporation
N. E. Loomis		1
Donald E. Sharp	1	
Paul E. Cox	1	
P. H. Swalm	1	
R. D. Landrum	1	
F. C. Flint	1	1
R. K. Hursh	1	
W. L. Shearer	1	
Karl Turk	4	
H. H. Clark		1
Office	9	3

Total 20 Personal, 6 Corporation

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Howard C. Arnold of St. Louis has moved to 5305 Delmar Blvd.

E. B. Baker of the Detroit Star Grinding Wheel Company is living at 764 Military Ave., Detroit, Mich.

Fred S. Bell of the Mandle Clay Mining Company gives as his address, 6645 Waterman Ave., St. Louis.

Richard Broadley, formerly of Champaign, Ill., has moved to 528 E. Jackson St., Mexico, Mo.

H. D. Callahan of Columbus is now with the Northwestern Terra Cotta Co., 2525 Clybourn Ave., Chicago, Ill.

Benjamin F. Carter of Peoria, Ill., writes that he is now living at 5905 Madison Ave., Bartonville, Ill.

Bertram L. Cassady, whose name has been listed among those whose addresses are unknown is with the Wellsville Fire Brick Co., Wellsville, Mo., with headquarters at 144 E. Latimer St., Tulsa, Okla.

Herman L. Cook, who has been at the University of Illinois is living at 327 N. Hazel St., Danville, Ill.

Sanford S. Cole gives 49 Jane St., Hornell, N. Y. as his address.

Robert M. Corl is now located in the National Supply Bldg., Huron St., Toledo, Ohio.

M. F. Cunningham writes that he is with the Waltham Grinding Wheel Co., Waltham, Mass.

John Fitzgerald formerly of Niagara Falls, N. Y. has moved to 572 Terrace Ave., Clifton, Cincinnati, Ohio.

M. S. Gifford who has been living at Libertyville, Ill., has recently moved to Lake Bluff, Ill.

Raymond Gilmore has resigned his position with the Laclede-Christy Clay Products Co., St. Louis and is living at 7710 Linwood Ave., Cleveland, Ohio.

A. F. Greaves-Walker, president of the AMERICAN CERAMIC SOCIETY, has moved to Stevens Pottery, Ga., where he has accepted a position as Vice-President and Manager of Operations with Stevens Brothers and Co., manufacturers of clay products. Mr. Greaves-Walker was formerly Production Manager with the American Refractories Co., at Pittsburgh, Pa.

Marshall W. Harris of the University of Illinois has secured a position at Ada, Okla.

J. W. Hepplewhite, recently of Manville, N. J. is with the Edwin M. Knowles China Co., East Liverpool, Ohio.

R. M. Howe has notified the Secretary's office that his address is 1120 Lancaster Ave., Pittsburgh, Pa.

Walter A. Hull who has been with the Bureau of Standards at Washington, D. C., has moved to Chicago, Ill., where he is associated with the Northwestern Terra Cotta Co.

Richard E. Jones of Tarentum, Pa. has moved to 620 E. Eighth Ave.

Harry J. Knollman asks that his mail be sent to 325 E. Ave. 31, Los Angeles, Calif.

George A. Loomis of Steubenville, Ohio is moving to 322 South Spring St., Los Angeles, Calif.

Gilbert McCall is living at 3018 K St., Sacramento, Calif.

George J. Openhym of White Plains, N. Y., is spending the summer at Scarsdale, N. Y.

R. I. Montgomery has moved from 1624 Niagara Ave. to 533 10th St., Niagara Falls, N. Y.

Carl Perg, formerly of Kalamazoo, Mich., is living at Des Plaines, Illinois.

B. S. Radcliffe has left the St. Louis Terra Cotta Co., and is now with the Northwestern Terra Cotta Co., Chicago, Ill.

Charles Rose of St. Louis has recently moved to 447 9th St., Niagara, N. Y.

Oscar Shearer is now living at 5 N. Karlov Ave., Chicago, Ill.

Vincent DeP. Schildmeyer of St. Bernard, Ohio, has moved to 6450 Kennedy Ave. Cincinnati, Ohio.

Dr. Felix Singer gives as his permanent address Berlin-Charlottenburg, Carmerstr. 18, Germany.

T. D. Tefft is now located with the Thurber Brick Co., Thurber, Texas.

Bruce F. Wagner of Ames, Ia., has moved to 3109 Home Ave., Berwyn, Illinois.

Alan G. Wikoff, Industrial Editor of "Chemical and Metallurgical Engineering," Chicago office is now in the New York office of the McGraw-Hill Co., 10th Ave. at 36th St.

B. W. Willson, ceramics student at Ames, Ia., is spending the summer in Galesburg, Ill.

J. A. Wilson of Elwood, Ind., has recently moved to Kittaning, Pa.

Harold G. Wolfram who has been studying ceramics at the University of Illinois is now with the Bureau of Standards, Washington, D. C.

AMERICAN CERAMIC SOCIETY SUMMER MEETING AUGUST 8, 9, 10, 11

TOLEDO—DETROIT—FLINT

Plant Visits

Glass House Refractories—Modern Machine Methods of making glass bottles, window and plate glass—Porcelain spark plug cores and assembled plugs—Enameled, steel and iron, common brick, grinding wheels, art pottery, and automobiles.

Pleasure Trips

Midnight on the Detroit river and Lake St. Claire. More tonnage travels on Detroit river than enters the metropolitan harbors, more than moves from New York, London, Hong Kong and Liverpool combined. The lake trips from Detroit are unsurpassed in scenery and comfort.

Belle Isle famous the world around as a park of beauty, refinement and educational opportunities; extensive aquarium, horticultural and zoölogical collections; concerts, boating, swimming motoring and casinos.

Headquarters

Secor Hotel, Toledo—August 8
Wolverine Hotel, Detroit—August 8, 9, 10, 11

Itinerary

August 8—	8 A.M.	Hotel Secor. Dr. H. W. Hess and A. S. Zopfi, committee in charge.
	12 M.	Complimentary lunch at The Toledo Yacht Club
	7:25 P.M.	Leave on Michigan Central train 306
	9:00 P.M.	Arrive Detroit (dinner en route)
		F. H. Riddle, Mrs. W. B. Stratton, H. F. Royal, H. S. McMillan, Jos. Hoehl, J. R. Kempf, committee in charge.
August 9—	9 A.M.	Chartered bus to Ford Motor Co. (experimental continuous pour plate glass plant) and Champion Porcelain Co. (Dressler Tunnel kiln operating at cone 18)
		Complimentary luncheon at Champions
	2 P.M.	Trips chosen by delegates
		Porcelain Enameling and Mfg. Co.

	Detroit Stove Works
	Wolverine Porcelain Enameling Co.
	Pewabic Pottery Co.
	Detroit Brick Plants
7:30 P.M.	Boat Ride—Dancing on deck
August 10—8:10	Leave by special cars for Flint
	T. G. McDougal, P. D. Helser and S. J. McDowell, committee in charge.
	A. C. Spark Plug Company (complete production and assembling of plugs), novel tunnel kiln operating at high temperatures.
	Buick Motor Co.
8:00 P.M.	Dinner with entertainment and dancing
	Hotel Wolverine
August 11—9:00 A.M.	Special bus to Detroit Star Grinding Wheel Co.
	River Rouge plants of Ford Motor Co.
	The Ford Steel plants
	Ford new plate glass plant
Week End	Lake trips as shall be chosen by the delegates.

COMMITTEES FOR ANNUAL MEETING OF THE AMERICAN CERAMIC SOCIETY

Atlantic City, N. J., February 4, 5, 6, 7, 8, 1924

Executive Committee

ANDREW FOLTZ, CHAIRMAN
R. H. Minton, Vice-Chairman
C. A. Bloomfield
Abel Hansen
Chas. Howell Cook
August Standt
F. W. Dinsmore
D. P. Forst
R. R. Valentine
H. Mueller
E. C. Hill
H. K. Kimble
G. H. Brown, Secretary

Railroad Transportation

WERNER MALSCH, CHAIRMAN
Geo. W. Gilks
Chas. E. Jacquart

Hotel Accommodations

FREDERICK STANGER, CHAIRMAN
Hubert Somers
Chas. H. Lovett
D. W. Scannel

Publicity

L. R. W. ALLISON, CHAIRMAN
C. W. Hill
Franklin G. Lord

Service

C. F. GEIGER, CHAIRMAN
Robert E. Anderson
W. L. Howat
R. E. Long
John M. Kreger

Banquet

R. H. MINTON, CHAIRMAN
F. A. Whitaker
E. C. Hill
Frederick Stanger

Finance

G. H. BROWN, CHAIRMAN
C. W. Crane
E. V. Eskesen
August Standt
C. S. Maddock, Jr.
M. M. McHose
D. R. Edgar
Abel Hansen

Reception

H. F. Staley, Chairman
R. L. Clare
August Staudt
R. P. Hazlehurst
Otto W. Will

Entertainment of Ladies

Mrs. G. H. Brown, Chairman
Mrs. A. Foltz
Mrs. R. H. Minton
Mrs. E. E. Hill
Mrs. F. Stanger
Mrs. R. P. Hazlehurst

Trips

D. P. Forst, Chairman
Leslie Brown
John A. Williams
Chas. H. Kerr
Geo. Simcoe
O. O. Bowman, 2nd
G. M. Tucker
H. A. Plusch
G. E. Hoffman

Exhibit

Ira A. Sproat, Chairman
K. E. Ward
John. P. Goheen
Eric W. Turner
C. T. H. Phillips

THE PITTSBURGH DISTRICT SECTION MEETING[1]

The meeting held on June 8, 1923, was called to order by Chairman, Professor A. Silverman.

Dr. E. W. Tillotson reported a balance in possession of the Finance Committee for the Silver Jubilee Convention. It was noted that this should be returned pro rata to the companies who had donated this money.

Chairman Silverman reported that the printing of stationery for the different Sections of the Society could be greatly simplified by having the new sectional and national officers take their office at the same time. It was voted that this report be received for future consideration.

The following committees were appointed to serve this year:

Program Committee: J. S. McDowell and F. C. Flint.

Entertainment Committee: R. M. Howe and H. G. Willetts.

Motion pictures of the Corning Glass Works were shown through the courtesy of J. C. Hostetter.

SUMMER MEETING OF THE NEW JERSEY CLAY WORKERS ASSOCIATION AND EASTERN SECTION OF AMERICAN CERAMIC SOCIETY

The Summer Meeting of the New Jersey Clay Workers Association and Eastern Section of the American Ceramic Society was held at the Trenton Country Club, Trenton, N. J., on Friday, June 29th.

The meeting was opened at one o'clock with a luncheon served in the ball room of the Club. Mr. Andrew Foltz acted as toast-master and a number of interesting speeches were given,—notable among which were those by Messrs. Charles Howell Cook, Chas. W. Crane, T. A. Randall, W. P. Blair, R. H. Minton and Thos. Campbell of Sydney, Australia.

[1] By H. G. Schurecht, Secretary Pittsburgh District Section, American Ceramic Society.

Following the luncheon a brief business session was held, President Andrew Foltz in the Chair. The following reports were then submitted for approval: Report of 1922 Summer Meeting, G. H. Brown, Secretary; Report of Executive Committee—R. H. Minton, Chairman; President's Report—Andrew Foltz.

Attention was called to the fact that the Eastern Section is to have charge of the arrangements for the 1924 Annual Meeting of the AMERICAN CERAMIC SOCIETY to be held in Atlantic City during February. President Foltz named the committees which have been chosen to make the 1924 Meeting a success in every way and one long to be remembered.

President Foltz announced the appointment of the following committee to be in conference from time to time with a committee of the Board of Trustees of Rutgers College concerning the work of the Ceramics Department:—

Abel Hansen, Pres., Fords Porcelain Wks., Perth Amboy, N. J.
H. A. Brown, Pres., Lenox, Inc., Trenton, N. J.
C. A. Bloomfield, Metuchen, N. J.
C. H. Cook, Pres., Cook Pottery Company, Trenton, N. J.
F. W. Dinsmore, Imperial Porcelain Wks., Trenton, N. J.

At the close of the business session, a very interesting paper entitled "The Application of Tunnel Kilns in the Firing of Ceramic Wares" was presented by Prof. Carl B. Harrop of Columbus, Ohio. Messrs. Conrad Dressler and T. G. McDougal contributed interesting discussions to Prof. Harrop's paper.

Mr. Chester C. Treischel, Secretary of the White Wares Division, AMERICAN CERAMIC SOCIETY, discussed "Feldspar Classifications and Specifications" and briefly outlined the work which the White Wares Division is doing.

At the close of the afternoon session it was found that a total of 110 members and guests had registered,—this being the record attendance at any Summer Meeting of the Section. A number of new members were enrolled and the meeting was voted a most successful one in every way.

AN EXPRESSION OF OPINION ON VALUE OF THE JOURNAL

M. R. Cuthbertson of Oroya, Peru, South America writes the following letter which is of unusual interest to the readers of the *Journal*.

"...As to the *Journal* let me say that I belong to another technical organization which costs me double the amount of dues for the AMERICAN CERAMIC SOCIETY and the monthly publication gotten out by this institute cannot compare with the *Journal* for technical value.

"The paper in question leans altogether too much to editorials written by men who cannot for some reason publish their writings elsewhere. For this reason we must wade through pages of pseudo-technical bunk in hope of sometime discovering something of use to us.

"I have no definite information, but I should judge that of all technical papers written perhaps one per cent of the information contained in them may be applied without much change. One paper, I remember well, for I combed it from beginning to end hoping to gain some information as to the hardness of the original material, the size, the content of moisture, or the size of the machines used. To me the paper was useless.

"This is not so with the *Journal of the American Ceramic Society*. Whether the writers are more practical, or whether they are simply better able to take in all angles of the subject, I cannot say. This much I know. I am making common, fire and silica

brick, and naturally am more interested in that line of ceramics than in the manufacture of glass, but I have been able to pick information of value to me in my line from a paper on the manufacture of glass in the *Journal*.

"When you consider that we are operating kilns at 12,000 and 14,000 feet altitude and lack of pressure and oxygen content produces problems in combustion, and that I can still get information of value on combustion from the *Journal*, I think we have good reason to think well of our contributors."

OBITUARIES

Arthur T. Beach

Arthur T. Beach, President of the Beach Russ Company, manufacturers of pumps, and President of the Abbé Engineering Company, manufacturers of grinding and pulverizing machinery, of New York, died at his home in Brooklyn, N. Y., on June 16. His death was due to heart failure. Mr. Beach was born in Connecticut in 1862. He founded the Beach Russ Company in 1891 and in 1912 became President of the Abbé Engineering Company. Mr. Beach is survived by three sons, all of whom were associated in business with him.

H. H. Preston

Word has been received of the death of H. H. Preston of Pittsburgh, Pa. Mr. Preston was employed with the J. W. Cruikshank Engineering Co., of Pittsburgh and was a member of this Society.

Haydn E. Vaughan

On account of the death of Haydn E. Vaughan, one of the younger members of the American Ceramic Society, his father Edward Vaughan, has asked that his membership be transferred to Willis C. Mellott, one of his classmates. Haydn Vaughan was a student at the University of Pittsburgh and lived at 7107 Mt. Vernon Avenue, Pittsburgh.

NOTES AND NEWS

PLASTICITY RESEARCH FUND AT LAFAYETTE COLLEGE

A letter to the Editor from Eugene C. Bingham, Professor of Chemistry, Lafayette College, Easton, Pa., states that the results of the work carried on during the past year have been so successful that he has made a contribution of $1200 toward the continuance of the work for another year. The full announcement of the character of this work on plasticity is found in the *Bulletin* **1** [11], 325 (1922). A report of the Research Committee of Lafayette College makes the following statement concerning this work.

"The plan this last year has been eminently successful, a large amount of information having been secured which will be published in due course. For example, a new method for measuring plasticity has been worked out which greatly simplifies the measurement of plasticity and reduces the time required to a tenth of that formerly required. As a result of this year's success, Lafayette College is ready to continue the present arrangement and $1900 has already been guaranteed toward the necessary $3600.

"It is proposed to continue the study of the fundamental problems of viscous and plastic flow, and it is hoped that the results may be applicable in flow connected with a single industry. The results of the researches will be made available through publication."

FUEL EFFICIENCY AT BRICK KILNS

Operators of numerous brick plants are putting into practical application the fuel-efficiency data obtained as the result of the series of burning tests at industrial kilns recently conducted by the laboratory car Holmes of the Department of the Interior, in coöperation with the heavy clay trade associations, according to reports submitted to the Bureau of Mines by its field agents.

A notable example has been reported to the Bureau from Birmingham, Ala., in the case of an operator of two brick plants near that city who had been operating his kilns without especial regard to modern, efficient methods. This operator, being a member of certain brick trade associations, receives through these associations the results of improved methods of burning as developed by kiln-burning tests conducted under the direction of the Ceramic experiment station of the Bureau of Mines at Columbus, Ohio. Against the advice of the old practical burner and everyone else connected with the work, the superintendent at one of the plants decided to try out the method as outlined by the tests made by the Bureau of Mines. The results were more than satisfactory. At this plant it formerly took about 9 days to burn a kiln with a consumption of over 1400 pounds of coal per 1000 brick. The company had contemplated building more kilns to take care of the demand. They now burn off the kiln in 5 to 6 days and use under 900 pounds of coal per 1000 brick. Instead of building more kilns, some of the other kilns are now idle, while the plant still maintains its capacity.

SUMMER MEETING OF THE PACIFIC NORTHWEST CLAY-WORKERS' ASSOCIATION

Driers and Drying

We invite drying specialists to come this way on their summer vacations to attend the summer meeting of the Pacific Northwest Clayworkers' Association held in Seattle, Wash., on August 25. *One big meeting* devoted to *one big subject* of vital importance to all clay manufacturers, in the *one big vacation* center of the country, in the vacation time.[1]

Seattle and the Puget Sound country furnish an ideal location for a summer vacation: Cool spring-like weather, salt water, fresh water lakes, snow-covered mountains, big deep cool forests, fishing, boating—any sport you wish; any variety of accommodations—metropolitan life in Seattle to camps on the beaches and mountains. Drive out in your car, visit the big clay plants of the Pacific Northwest and see the wonderful possibilities for future development in all branches of the clay and ceramic industry.

Our association has a membership of over 50 and is only 6 months old. 70 attended the last general association meeting and over 30 came to the Brick, Tile and Sewer Pipe Division Meeting held June 2.

[1] For particulars, address Hewitt Wilson, Secy.-Treas. U. of Washington, Seattle, Washington.

PACIFIC NORTHWEST CLAYWORKERS' ASSOCIATION[1]

Reports from Brick, Tile and Sewer Pipe Division Meeting

The program of the Pacific Northwest Clayworkers' Association on auger machines, lamination and brick-laying school work proved to be instructive, practical and of financial value to those who attended this meeting in June.

Mimeographed copies of Mr. Adderson's paper on lamination and die working and the ceramic department's 11 page outline of the same subject can be obtained from the office of the secretary, ceramic engineering department, University of Washington. The request from non-members of the association must be accompanied by 25 cents to cover the cost of the mimeographing and postage.

As a result of a resolution passed at the meeting, the following telegram was sent to the American Construction Council in the name of the Association:

Franklin D. Roosevelt, 120 Broadway, New York City: "We understand that the American Construction Council proposes to undertake a publicity campaign to stop new construction in all parts of the country for ninety days. We are not familiar with conditions in the East except from news reports such as *Literary Digest*, but understand that millions of dollars of work have already been indefinitely postponed. We feel that building is a basic industry and highly essential to national prosperity and delay at this time will result in a serious depression. In Pacific Northwest building is only beginning to revive after a number of years slump. We do not have labor shortage here and prices of building materials are not unreasonable. Our manufacturers, architects, contractors, builders and labor need work this year. Your proposed action will tend to drive our skilled mechanics to other occupations and to other sections and result in a permanent loss. If any warning is needed we feel that the publicity already given your proposed action is more than ample and we earnestly protest the continuation of such propoganda covering the country as a whole and the Pacific Northwest in particular. Our association is composed of manufacturers and employees of brick, tile, sewer pipe, terra cotta, pottery and other clay product industries of states of Washington, Oregon, Idaho and British Columbia. At meeting held yesterday a resolution was passed that this protest be wired to you." Pacific Northwest Clayworkers' Association, Hewitt Wilson, Secy.

We feel that it is imperative for us to unite all our efforts in encouraging building at this time and to resist movements of this kind which tend to discourage construction. Have the various organizations of your community sent in protests to the American Construction Council?

VOLUNTARY ADOPTION OF STANDARDS OF QUALITY

Editor's Note:

Standards of Quality.—Much profit has resulted from standardization of size, shape and design. The elimination of unnecessary varieties has been practiced for a sufficient time and in a large enough number and varieties of industries to demonstrate it to be of vital economic importance. So it will be with standardization of quality.

On page 191 of the *Bulletin* section of June *Journal* appeared a communication on this subject from Julius H. Banner, President of U. S. Chamber of Commerce. His

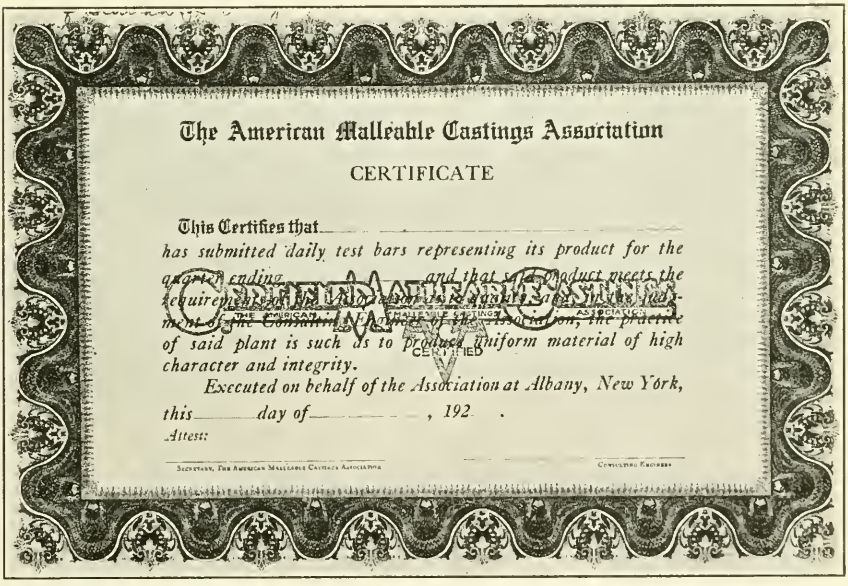
[1] For a summary of Mr. Cook's work in his brick-laying school, address, Mr. C. W. Cook, 3135 Broadway North, Seattle.

statements rang so true that the material from which he drew his observations was sought and the following letter and data were obtained. This letter under date of May 22 was written by C. L. Ishleman of The American Malleable Castings Association to E. H. McCullough, Manager, Fabricated Production Department, U. S. Chamber of Commerce.

How the American Malleable Castings Association Establishes Quality Standards for the Products of Its Members

"This letter will reply quite fully to the recent *Bulletin* of the United States Chamber of Commerce under the caption 'Voluntary Adoption of Standards of Quality.'

"For more than ten years, The American Malleable Castings Association has been carrying on the work of quality standardization now so urgently recommended by Secretary Hoover and the Chamber of Commerce of the U. S.



The American Malleable Castings Association

CERTIFICATE

This Certifies that _____

has submitted daily test bars representing its product for the quarter ending _____ and that such product meets the requirements for Malleable Iron Quality Grades under the Government of the Commission of the Inspection Bureau of the Association, the practice of said plant is such as to produce uniform material of high character and integrity.

Executed on behalf of the Association at Albany, New York, this _____ day of _____, 192 .

Attest:

_____ _____

Secretary, The American Malleable Castings Association Consulting Engineer

"By coöperative effort and scientific research the malleable iron industry has really found itself, and is today recognized as one of the country's outstanding examples of what well directed Association effort can accomplish in producing a uniform product of the highest quality and integrity.

"As the voluntary establishment of quality standards has been the keynote of our Association effort for many years, we are in hearty sympathy with the Department of Commerce in their present effort to use this means of protecting consumer interests and take pleasure in giving you the following outline of our effort in this direction."

"Ten years ago, there was little definiteness to the physical properties of malleable iron and there were practically as many varieties as there were foundries making it.

"Every foundry had its own theories, many of which were based on meager and insufficient knowledge of the whole subject. The annealing process by which the casting loses its brittleness and takes on the valuable properties of malleability was accredited to reasons that later have proved erroneous.

"In fairness, it must be said that even at that time, there were a number of manufacturers who were striving independently to improve the quality of malleable iron by scientific study and research. Whatever discoveries were made by them were jealously guarded as trade secrets and the industry as a whole did not benefit. This policy proved a boomerang to the industry in that inferior castings still being made by old rule-of-thumb processes threatened to stigmatize all malleable castings regardless of quality.

"This was the condition prior to 1913 before scientific research and testing of materials through coöperative effort were begun.

"The American Malleable Castings Association, now made up of about sixty representative companies in this industry, at that time comprised about twenty-five members. This group determined to enlarge their field through coöperative action and to take certain, definite steps toward raising the standards of the industry. They decided

1.—To go the limit in the matter of metallurgical research regardless of cost, in order to make *uniform*, high-grade castings.

2.—To disseminate this scientific knowledge among all members so that the entire Association could make such castings.

3.—To see that every public statement regarding the progress should be conservative and that it should be accompanied by accurate data to substantiate it.

"At this time a Research Department was organized and Professor Enrique Toucedah an eminent Consulting Engineer of Albany, New York, was retained to carry on the research work of the Association. The veil of mysticism that had been woven about the production processes of some of the more successful foundries was lifted and the best from each was adopted.

"Since that time the Consulting Engineer has labored unceasingly to instruct members in sound plant practice and correct principles of manufacture. Thus it is seen that in the obtaining of business members of the American Malleable Castings Association are competitive, but in the improvement of their product, coöperative. Through research, the Association has become an instrument of service to all industries in which malleables are used and has raised the manufacture of malleable iron from a hit-or-miss proposition to a scientific basis."

Test Bars Submitted Daily by Every Member

"When the research work was started one of the first requirements was that each member of the Association submit test bars daily to the Consulting Engineer for an independent determination of tensile strength, elongation and other important physical properties. This practice not only shows the quality of each member's product, but furnishes data on which a comparison could be made of the product of the whole membership. Equally important, it also served as a direct and positive measure of the improvement in quality from month to month. This practice of requiring every member to submit test bars from daily heats, still continues and is supplemented by Inspectors, acting solely under the direction of the Association's Consulting Engineer who make frequent, unannounced calls upon member companies to check up the manufacturing processes, the product itself and in general to serve as a check upon the actual test on bars submitted by member companies. The test bar record thus reinforced by constant field investigation of plant methods may be considered as truly representative of the product."

Constantly Setting Higher Specifications at Which Members Could Aim

"At the time the research work was started, the specification of Malleable Iron of the American Society for Testing Materials called for a tensile strength of 38,000 pounds and 5% elongation in two inches. This specification while exceeding the product

of many of the foundries was, as later developed, far short of the possibilities of the metal when properly made.

"Through individual plant inspection the adoption of the more successful practices and the submitting of test bars regularly, it was not long until the majority of the plants were making a product that exceeded the A. S. T. M. specifications. Upon the direct solicitation of The American Malleable Castings Association the A. S. T. M. specifications were raised to 45,000 pounds tensile strength and $7^1/_2\%$ elongation. This higher specification was later adopted by the S. A. E. and other technical organizations.

"Inspired by its success in constantly improving the quality of malleable iron and not content to 'leave good enough alone' the Association aspired to a still higher standing for the product of its members. The result is that a new specification of 50,000 pounds per square inch tensile strength and 10% elongation has recently been adopted and again the different technical societies will be requested to raise their specifications for malleable iron.

"This latest specification is 32% higher in tensile strength and 100% higher in elongation, than when the research was begun. During this same period, other valuable properties such as uniformity, soundness, rust-resistance, and easy machining have shown even greater improvement.

"It is doubtful if, in the entire history of American industry, there exists a similar instance of a trade association requesting that the leading engineering societies increase the rigidity of the specifications covering the product of its members."

The Practice of Issuing Quarterly Certificates of Merit

"As an incentive to greater effort toward improving quality, the Association a few years ago instituted the practice of issuing quarterly certificates of merit. As the awarding of a certificate for a given quarter is wholly in the hands of the Association's Consulting Engineer the only possible way in which one can be secured by a member is through rigid adherence to requirements in connection with physical tests and integrity of product during that period. Before a certificate can be awarded to a given plant, two general conditions must prevail:

1st, the test bars from each day's production sent to the Association's laboratories must have met the Consulting Engineer's requirements for tensile strength and elongation, and

2nd, the plant practice of the member during the same interval must receive the endorsement of the visiting Inspectors.

"Out of the practice of issuing certificates to members, came the idea of Certified Malleable Castings —the product of certificate-holding plants.

"While originally intended only as a reward of merit in foundry practice, the possession of a certificate has come to be a guide by which buyers determine the source of supply for their malleables.

"It is interesting to note that frequently members have striven for years to get their name on the published list of Certified Malleable producers, even going to the expense of rebuilding their plants and revamping their equipment and foundry practice in their effort to meet the Association's requirements for Certified Malleable Castings.

"If, for any reason, the product of any member falls below the established standards, for any quarter, the name of that company is omitted from the quarterly list of Certificate Holders and his name is also omitted from the list that is part of every magazine advertisement put out by the Association. Thus it can be seen that there is a real penalty imposed should a member become careless or indifferent.

"Copy of certificate issued to member companies is attached to this letter.

QUALITY STANDARDS AS DEVELOPED BY SOME TRADE ORGANIZATIONS

American Gas Assn.—Association nomenclature, material, specifications, abbreviations and performance specifications.

Associated Metal Lath Mfgrs.—Association has standards for weight, tolerance quality and gage.

Electric Power Club.—Association numbers among its principal activities the matter of quality of standardization.

Hollow Building Tile Association.—Association has standards for weights, sectional dimensions and tolerances. (Some of these standards are only in the recommendatory stage.)

National Paving Brick Mfgrs. Assn.—Association has standard specifications for wear and tolerances and standard methods of testing.

Portland Cement Assn.—Association has standard specifications for testing which have been adopted by the U. S. Government, American Society for Testing Materials, and others.

American Malleable Castings Assn.—One of the most outstanding cases of quality standardization. Tensile strength of castings increased from 38,000 pounds to 50,000 pounds. Elongation raised from 5% to 10%. Association maintains inspection and certification service.

Cement Products Assn.—Quality standards established and adopted. Association maintains test, inspection and certification service.

REPORT OF CONFERENCE ON SIMPLIFICATION OF HOLLOW BUILDING TILE

Elimination of 23 of the 36 prevailing sizes recommended

At a meeting held June 19, 1923, at the Department of Commerce, the Standards Committee of the Hollow Building Tile Association reported to the Department's Division of Simplified Practice, the results of a survey which the Association had made of existing varieties in types, sizes, and weights of hollow building tile.

The survey showed 36 different sizes—each made in a wide variety of weights. The Committee recommended the elimination of 23 of the 36 sizes, and the retention of 13 as "standards" for the industry. A standard weight, with a permissible variation of 5% over or under the standard weight, was also recommended for each of the 13 sizes retained.

The Committee requested the Department of Commerce, through its Division of Simplified Practice, to call a general conference next October of manufacturers, architects, engineers, contractors, and builders to discuss the general adoption and use of the recommended standard sizes and weights.

Those present at the meeting were: E. R. Sturtevant, Fraser Brick Co., Dallas, Tex. H. R. Straight, Adel Clay Products Co., Adel, Ia. H. C. Downer, Malvern Fire Clay Co., Malvern, O. P. H. Bevier, National Fire Proofing Co., N. Y. C. W. Dixon, Columbus Brick & Tile Co., Columbus, Ga. F. J. Huse, Research Engineer for the Association, Chicago, Ill. E. W. McCullough, Mgr., Fabricated Production Department, Chamber of Commerce of United States, Washington, D. C. Ray M. Hudson, Division of Simplified Practice, Department of Commerce.

This is another decided step forward in the Hoover plan to reduce the cost of building construction through elimination of waste in industry, Ray M. Hudson, the Commerce Department's representative at this meeting declared as the session closed.

CALENDAR OF CONVENTIONS

American Association of Iron and Steel Electrical Engineers—Buffalo, N. Y., September 24–28, 1923.

AMERICAN CERAMIC SOCIETY (Summer Meeting)—Toledo, Detroit and vicinity, August 8, 9, 10 and 11, 1923.

AMERICAN CERAMIC SOCIETY (Annual Meeting)—Atlantic City, Feb. 4, 5, 6, 7 and 8, 1924.

AMERICAN CERAMIC SOCIETY (Exposition Meeting); Wednesday, September 19, is Ceramic Day.

American Chemical Society (Fall Meeting)—Milwaukee, Wis., Sept. 10 to 14, 1923.

American Electrochemical Society (44th Meeting)—Dayton, Ohio, September 27–29, 1923.

American Face Brick Association (Southern Group)—West Baden, Ind., November, 1923.

American Gas Association—Atlantic City, October 15–20, 1923.

American Institute of Electrical Engineers—Del Monte, Calif., October 2–5, 1923.

American Society of Sanitary Engineers—Davenport, Ia., September 10–13.

Common Brick Manufacturers of America—Los Angeles, week of Feb. 11, 1924.

National Exposition of Chemical Industries—New York City, September 17–22.

National Safety Council—Buffalo, N. Y., October 1–6, 1923.

New York Hotel Association—New York City, November 19–24, 1923.

Power and Mechanical Engineers—New York City, December 3–8, 1923.

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BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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Vol. 2 September, 1923 No. 9

EDITORIAL

"HE PROFITS MOST WHO SERVES BEST"

Service and Profit.—These have a "cause and effect" relation. There is no just or lasting profit, except through service. Dishonest and incompetent service profits no one. Profit is gotten only through constructive service. A Society is an association for mutual or joint usefulness and profit.

The intent and expectation of the American Ceramic Society is that it shall render efficiently and timely the best possible constructive service. The Society has no heart, no mind, no will and no power to do other than is possessed by the members. The Society is but the means of collaboration of its members in service. The character of service to be rendered by the Society is the character of service which its members will it to be.

If a member or group of members wish a certain service from the Society, it will be necessary to do more than to wish; a service of the sort desired can be rendered only when the members themselves render such service. Those who have profited most from the Society are those who have rendered through the Society the sort of service they wish the Society shall render them.

"He profits most who serves best."

PAPERS AND DISCUSSIONS

DISCUSSION ON "ARTISTIC MODERN FAIENCE"[1]

C. DRESSLER:—Several years ago I heard Mr. Bleininger speak anxiously about the condition of the art of pottery, saying that it was more than ever necessary now that the latter should take an artistic direction. As he is a purely scientific man, I was very much struck with this remark. It was entirely my point of view and it greatly strengthened my opinion, as my paper indicated. I should like to encourage the discussion, because I am very much interested in the study and I have no doubt there are views which are diametrically opposed to mine. I should like to hear them, so that I might have the opportunity of defending my views.

I believe that my scheme, if tried out in a large factory might be somewhat costly because it could not be done at once. People have become so accustomed to the present methods of production that it might take quite a time to change, for the foundation of the proposal is to give freedom to the worker. That is, in fact, the whole principle.

The worker at the present moment is under a certain discipline, which is excellent for production, but which is very bad for art. He is told he must do one particular thing only. There is a great deal of division of labor, and so it is quite a small part he is concerned with. He is told also that a large order must be gotten out rapidly.

The plan I propose consists in giving the worker an opportunity to once more use his brains and his taste and feelings. As soon as you begin to do that you may disturb the whole industrial establishment, unless you regulate it and determine limits within which the worker is allowed to use judgment. That is a very important point. Somebody has to say to the worker, "You can use your brains and taste up to this point, but you must not go beyond."

Tradition has been destroyed. We have no tradition. Tradition has to be reintroduced.

Many young artists in France and other places have attempted to compete with large establishments and have failed because they have not been able to turn out the work in time, or they have been impractical. So there is no use in attempting once again in the same way what they have failed to do. That is why I have assumed that a big establishment or factory should take up the idea.

Such a factory is going to look at it from a financial point of view. And that is quite right, because no commercial venture can go on if it costs more than it produces. But I have a very strong feeling that if you give a workman an opportunity of using his faculties, it is going to be a

[1] *Jour. Amer. Ceram. Soc.*, **6** [2], 398 (1923).

wonderful incentive to him, and that, instead of reducing the production, you are going to increase it. I also foresee that it is not going to be at all costly after it once gets going. But to get it going necessarily means expense.

Suppose we have a terra cotta factory for I am thinking of the buildings we see everywhere, faced with glazed or semi-glazed terra cotta. If such a factory tried out this scheme the first thing they would need would be a room set apart with a good light. I do not suppose that would be very expensive. They could find a room with a north light so that the sun would not come in and disturb the effects. Then they would take one or two of their employees who seemed brightest and most interested and make a start. Then I think a very essential thing would be to have a place where the results could be seen and discussed. Therefore, I suggested a little outside wall or courtyard where the pieces could be viewed. I have always liked to put things up at about the height they belonged and to look at them. Sometimes I come to the conclusion that the next thing I do will be slightly different because the effect is not very good; on the other hand, sometimes I am very much pleased with it. So that the opportunity of seeing the work is a very necessary part of this scheme. The factory hand at present never knows what his work looks like. He is not supposed to be interested; but here he would be expected to take an interest. This is an expense.

In regard to materials, I should certainly not introduce any fresh materials to begin with. I should take the clay the factory used. Probably it would be a suitable clay for the work. And whatever it would be, it would have artistic qualities. The point would be to bring out these qualities. Therefore, there would be no extra expense in the matter of the clay. In regard to the firing, this would undoubtedly be the correct one for the clay used so there would be no expense there.

With respect to colors and enamels, I would try to utilize those the factory had. That would be a very essential thing so as not to disturb the business more than necessary. As a rule the number of colors and glazes used is considerable and it is really not a case of increasing the number but, rather, of selecting only a few out of them. So there would be no great expense there.

But there would be other expenses. Somebody has to manage the department, give his whole time and thought to it, and that person has to be paid. And no doubt the results would not be forthcoming immediately. There might be some results at the end of a month or two, but they might not be good enough to be considered worthy of use and it might take several months before you got to a point where you could say, "We are going to put up a façade, or a structure to send to the Architectural League in New York, or some other place, as an exhibit of a finished product we are

proud of." It might take quite a time to reach this point and therefore, it is bound to cost a little money. What this amount is, I cannot tell for there are too many unknown quantities. I have tried to work it out, but I have not been able to get anything definite. But if you want artistic work you have to use the people in a different way from that in which they are being used now, in order to bring out their talent. That latent quality and taste exists among certain people. I do not say everybody has it, but a certain number of people have. That taste is capable of development and it can be brought to a high pitch. You only have to go to Europe, to the places where they do traditional pottery to see some very charming things sometimes at a very small cost. They charm you because there is the human touch there and a sense of proportion. At a place called Mold, in Wales where I went on a walking tour some years ago I came to a little pottery where they made pots and plates and jugs for common use. They had the most charming money boxes with pigeons and other birds on them. These were put there by children and they were most happily arranged. That is due to a natural talent. I am sure that talent exists everywhere, but it has to be brought out again. It has been crushed and it has to be reborn. It has not been absent more than three or four generations; it has to be revived and the conditions under which it can be developed anew have to be considered. This has to be done in the modern factory, because that is the only place at the present moment where such a thing can be done.

Miss M. G. Sheerer:—Mr. Mercer with the Norristown Tile, and Mr. Allen, with the Allenthorp Tile, it seems to me are doing a very similar thing. These are not factories, but they are bringing out the most artistic results and are in no sense commercial. They have made a financial success of it, and if it could be done in that way, I do not see why it could not be introduced into the larger factories.

C. Dressler:—That seems to prove my theory, doesn't it?

Miss M. G. Sheerer:—Yes.

Mrs. G. O. Totten, Jr.:—I think just the same thing has been done in Sweden. I was in charge of this work, producing very good results. The girls I employed were very much interested.

C. Dressler:—That is very satisfactory. Did it create a good feeling?

Mrs. G. O. Totten, Jr.:—A very good feeling, indeed. Afterwards I had to go around and exhibit these things in different cities in Sweden and Denmark and Norway, and that increased the interest still more.

C. Dressler:—These were not buildings?

Mrs. G. O. Totten, Jr.:—No, these were figurines.

C. Dressler:—What is true for figurines and small things would be equally true for large work. I am speaking of the modern buildings.

Mrs. G. O. Totten, Jr.:—I think it could be done.

F. H. RHEAD:—There is one thing to consider; it is one thing to make things in a small way and entirely another to make terra cotta for a forty-story building, involving thousands of tons.

W. D. GATES:—In pottery and with the things cited here, you must remember they kill the imperfect. One good piece comes out, is admired and is handed down, commended; but the bad pieces and the mistakes are broken up. I do not know to what extent Mr. Dressler has investigated the plants that are running today or the methods that are being used but I could not help but think that if he was speaking of trying out the cost of this experiment, he would have to buy a large lot in some one of our cities, and put up a building.

I, too, have dreamed many dreams, and some of them have had sad endings. As a matter of fact, the manufacturer of terra cotta today is absolutely under the control of the architect. We find the architect has a scheme for the entirety of his building, and if you distribute that work among girls and boys to let the individuality of each show itself in the work you would have a hodgepodge in the general result in the building.

I believe in individuality and in the pride of a workman. We have our factory out by itself away from everyone else, much to the horror of many people who cannot consider why we do it. But everyone that goes through that factory says that there is a different atmosphere there from what is found in other places. Someone said to an architect going through recently, "Did you enjoy your trip?" He said, "I should say I did. Everybody met me with a smile, and when I go through some of the other factories I am looking over my shoulder to see if someone is not hitting me with a brick." We do not unduly curb or guide individuality.

The modern building reminds me of a composite picture of a large number of people made by imposing each negative for an instant over a sensitized plate. The construction of one of these large buildings seems to be the composite of all the people engaged in its building, from the mortar mixer clear through. It is a little bit of each man's life, a composite. But it all has to agree with the architects' drawings.

We are kept down, controlled, by the architects and by the owners. Mr. Dressler would have a very hard job justifying the individuality or the carelessness or the conception of the individual workers to the committee in charge of the building or church. Such a justification is absolutely necessary to make collections.

The artistic tendency of the terra cotta man or the potter has but a fleeting reputation. You do not know the potter who made della Robbia ware. Della Robbia was working in bronze and marble, and evidently went to a potter to get clay because he had to model in clay first. They were making enamel which he utilized and today his works are priceless in the best museums in the world. We do not know anything about the

potter. As a matter of fact, there is a glamor that goes with that. Some people consider it a lost art. The potter or the sculptor has a better field to work in today than he had in the time of della Robbia. The della Robbia ware would not stand in this climate. It did not stand exceptionally well four hundred and fifty years ago in the climate of Italy.

I have had this same scheme in our factory, in the modeling room. I have had men who would look at an architect's drawing, and say, "I can give them a better thing than that." That man cannot be employed for though he may make something better in that one individual pattern in the broad scheme of the architect's feeling of what that building will be it will not fit in; the architects have their peculiarities worked into the scheme of the building as a whole.

There is the question of color. For a long time we have had colors and we have tried very many things to bring them to the architects. Many years ago I had Maratta for over a year at the factory, making landscape panels in terra cotta. He painted pleasing ones in water colors. I sent some of these in terra cotta to the Architectural Exhibit in Philadelphia. I was very ambitious, and I thought that by showing a realistic landscape painting in colored enamel the architect would immediately say, "If they can paint a realistic picture in ceramic colors, they can certainly give me anything I need for use in a conventional design." Those panels came back from Philadelphia, thrown into their boxes. I wrote to some friends in New York and got back courteous letters saying their committee for the New York Exhibit had gone to Philadelphia and had looked at these and did not approve of imitation of oil paintings in terra cotta, and then they added, to save me, "You have done so much beautiful work, why can't you send some real work here?" Of course, I became indignant and did not send anything. But that is the way things are looked at.

We have tried to get architects to use colors. They are afraid of them. You can readily see why this is. As you go through the country you see Greek buildings, one after the other. It is a very safe proposition, to take something that has been commended for many generations. You cannot make a mistake. I have had one architect after another worked up to the point of using color, but each time they cut it all out for fear they would make a "botch." It is a dangerous move.

We have tried *individual* work in this way. I think it has to be controlled. Somebody who is running the establishment has to watch the men, to control them and work out something that will be consistent all the way through. If it shows the individuality of any one of the men there is going to be quarreling.

We have gotten the enthusiasm of our men in their work and we have been doing it in this way. The men cannot go to see these buildings because they are very widely scattered, but we get progress photographs

as they go up. We post these on the bulletin board. Each man can say to himself, "There is my work, I did that." But we cultivate the idea among them, not that "I did that," or that "You did that," but that "that building is the collective work of the whole crowd," and their enthusiasm is very earnest. When we get a letter of commendation, as we sometimes do, we post the letter on the bulletin board, and the men feel that they are really accomplishing something that is standing and will stand after they are gone.

The proprietors of the Radisson Hotel in Minneapolis had a cellar they wanted made into a dining room. It was a most desolate looking place and had to be handled very carefully. The ceiling was a suspended ceiling of plaster. There were to be twelve panels around the room, something like twenty-five or thirty feet long and four and a half feet high, and those panels were to have scenes in color from the Upper Mississippi and the Northwest. This thing had to go through the factory in very quick time. That is the thing we are up against all the time. There is no time for experiment. I got Charles Francis Browne, one of the best landscape painters in Chicago, to make small oil paintings of these different scenes. We took these to the factory and reproduced them on five-inch tile set upon an easel the size of the panel, with allowance for shrinkage. They were plastic. We drew the lines of the landscapes in the plastic clay. Then we dried and re-assembled them. Browne selected the colors and tints. You had to know what color you were putting on for when applied they did not exhibit the fired color and tones. We were successful in getting the job through on time and were very much commended.

There are fields of that kind, in which the artist can find opportunity for self expression but there is the imminent haste demanded by commercialism in your payrolls. They are running all the time, and you cannot run very long unless you can make collections.

I think there is a big field for individuality, but this individuality must be restrained, just as our modelers are restrained. We have no particularly lasting reputation. I have been at work forty years putting up these buildings. I go by them and think of the work I went through getting the material there and my part in the erection of the building. The owner or the architect, however, is the one who has the glory, just as della Robbia had the glory. But there is a big reward in feeling that you are making something that is fine. You have to have the enthusiasm of the workman in it or else you do not get a good thing. It has to be controlled, and commercially it has to be controlled by the owner or the architect.

They have a better palette of color now in ceramic ware than ever before. We have had to test each one in our climate. And this AMERICAN CERAMIC SOCIETY has played its part in this wonderful work. When I

look at the five-foot library they have built up, I am filled with pride. My pride is none the less because I really had but little to do with it, but I have had the privilege of associating with the men who were doing it.

MAJOR TOTTEN:—I am not a potter, but I feel that the architects are being criticised in some way in which I do not think that they themselves would like. That is to say, I do not think an architect puts himself up as the primary designer of a building. He says, "I am the designer of the main part of this building, but I cannot succeed alone. I cannot make an artistic production, unless I have the coöperation of artists in all the lines that are connected with this building."

The Public Library in Boston is to my mind one of the best architectural buildings in America, and yet it is quite as famous for its paintings as it is for its architecture. And there is no reason why ceramic work, which is coming up with such splendid strides in America, should not produce works which should be signed by the artist and which should stand just as high as any of the work which the architects do.

There is, also, the question about the construction and decoration in architecture. I have had a feeling for colored architecture for many years. I have tried a few simple specimens, and the question of how terra cotta work should be used in architecture is very puzzling. Architects, I think, do not feel they have entirely solved the problem. There is one class of building, like the Woolworth Building, terra cotta building, in which all the architectural parts are in terra cotta. They might just as well be in stone, and the architectural moldings are designed as if in stone, and yet here and there there are patches of polychrome. The other class of building is that done by the Moors and Arabs; they are not structural at all. They are surface decorations, using a real interior surface decoration put on the outside. That was more or less a questionable external architectural effect. Another method is one by which they use terra cotta and ceramic products in connection with other materials. That seems the most logical thing. For instance, the façade which the American Encaustic Tiling Company has done in New York for their own building, I think, is a very rational thing. They have taken an old house and remodeled it. The effect is a combination of materials by using a plain surface for their masses and then enriched their doorways and windows with terra cotta. That seems to me one of the most rational uses of terra cotta.

C. DRESSLER:—I feel encouraged by what has been said by the several speakers.

Mr. Gates has said that the manufacturer of terra cotta is absolutely under the architect. Now this is a point which I deplore and want to see corrected. Mr. Totten, as an architect, looks upon such a statement as a severe criticism of his profession. The architect should not be the only designer of a building; he can only succeed in an artistic work by the co-

operation of artists in all the branches. It is this artistic contribution that it is the evident duty and privilege of the potter to give. Others beside Mr. Totten hold this view. A member of the Architectural League appealed to the potters for a free artistic rendering of their art in the terra cotta they produce, to get away from the stereotyped imitation of stone or granite. I think that most people are now agreed upon this point.

Mr. Gates has said that if the terra cotta work is distributed among boys and girls and the individuality of each is allowed to show itself, one will have a "hodgepodge". I have been careful to say that I would not allow such a freedom to the workers. I have explained that their faculties, now lying dormant, must be awakened and trained to work in harmony and in unison. It is like an orchestra, of which each member has his limited task under the leadership of an able conductor.

Even with a trained band of workers, under capable leadership, it is quite probable that the interpretation of the design of a modern architect might fail to satisfy him. That is why I propose that the results of the coöperation and coördination of the workers, under this leadership, shall first be expended upon independent examples, which would not be ordered but which would be submitted to architects as specimens of their skill. If, shown in a public place, they succeed in pleasing the architects, these will design buildings in conformity with what they know the factory is capable of turning out.

They may have suggestions of modification and improvement; they may even take a friendly hand in the development of the art. That is exactly what we want. But now, there is no original modern pottery work for them to go upon, so they are restricted to sending potters the ordinary stone building blue prints to which the manufacturer has to conform at his peril.

I appreciate that Mr. Gates' factory is conducted in a very liberal spirit, and that the workers are treated with real humanity; also, that they take a corporate pride in the structures in which they have a hand; but, if Mr. Gates will follow me, he will see that it is a quite different interest and stimulus that I am giving to the individual worker. I am glad to have the experience of Mrs. Totten in support of my theory as well as the further confirmation of Miss Sheerer.

Undoubtedly, the delight in the use of creative taste in coöperation is a powerful element making for good in human work. I use the word "creative" advisedly. Every time that the faculties of man are used freely, they are in a measure creative and original, and their employment is a delight.

Why leave it out, when it is there for your service? Mr. Gates says that the man who sees his way to improve upon the architect's design is a dangerous person. But, properly disciplined, he is the most valuable

person in the factory. His talents, of course, cannot be exerted upon work which has already reached the final stage and been blue printed. Use him in the experimental work and what he does will appeal to the very architects who would have every reason to resent his making modifications in their finished plans.

Another thing, which I think Mr. Gates did not apparently quite realize, was why the architects failed to appreciate the reproduction or copying in faience ware of paintings in oil or water color. The fact is that they would not know of the enormous technical difficulties overcome, and of the handicap of our altogether too short space of time to do the work in. They would judge only by results.

Copies never are satisfactory. That has been proved over and over again. It seems like a law of nature and I believe it to be a beneficial law. It makes necessary the use of the creative faculties whenever anything really beautiful is aimed to be done. A good oil painting we know gives great pleasure; done with pottery or tapestry, it loses its charm.

I do not know whether Luca della Robbia fired his own pieces. I fancy he did, with the assistance of his nephew, Giovanni. I am glad he was mentioned, for I should like to see the potter receive the credit for his work, and a beautiful building be ascribed to him, no less than to the architect who supplied him with his opportunity.

What I am advocating is now desired by many thoughtful people. It is bound to come about, sooner or later. Let me repeat that it is not really a very expensive experiment, because it will have the hearty coöperation of the workers, and because as soon as good results begin to appear they will gain favor with the architects and the general public. The potter, who has the vision and the courage to make a start along these lines, will lead in this great and important field, and gain his reward. I hope that Mr. Gates will be that potter.

DISCUSSION ON "THE MECHANICAL STRENGTH OF GLAZING GLASS"[1]

CHAIRMAN HOSTETTER:—This interesting problem on the tensile strength of glass is open for discussion.

J. H. FORSYTHE:—I think the work should be carried on as he pointed out.

A. E. WILLIAMS:—The results shown we thought were pretty consistent for the rough rolled and wire glass, in which we tested five days glass at

[1] A. E. Williams, *Jour. Amer. Ceram. Soc.*, **6** [10], 981 (1923). Received too late to page with original paper.

the same factory. We showed a variation for one day, a modulus within ten per cent. That is not the maximum: that is the average variation from the average volume.

Now, for the thinner glass the variations ran greater than that and in some cases as high as twenty per cent. I have a few figures here. The maximum average for any one day of about twenty days' production at the factories, the modulus was 8600 maximum and 5500 minimum. That minimum is for rough rolled glass. For ribbed glass the maximum was 5700 and the minimum was 4600. For plain rough wire glass the maximum was 7900 and the minimum 5600. That represented different factories.

For ribbed rolled wire glass the maximum was 7300 and minimum 6200.

For corrugated wire glass the maximum was 17000 and the minimum 12900.

For $^3/_4$-inch deep corrugation, the maximum was 10,000 and the minimum 9100.

For polished plate the maximum was 6900 and the minimum 6000.

For unshatterable glass the maximum was 9500 and the minimum 6700. There was quite a variation.

On the clear sheet glass we got the greatest variation. The maximum was 12,700 and the minimum 6000.

I have also taken an average for these various types of glass which you might recommend for up to date engineering practice in figuring strength for construction purposes:

Single and double strength, or 26 ounce	7000
Heavier sheet glass and quarter-inch plate	6500
Rolled sheet and wire glass	6500
Ribbed rolled sheet or ribbed wire glass	5300
Corrugated glass	13,500 and 9500

SULPHURING OF GLASSES[1]

By J. C. Hostetter

J. C. Hostetter:—I suggested this title to find out something from the discussion. Apparently sulphuring may be the result of several causes, one predominating at one time, and another at another time under some other conditions. Sometimes it takes place in the working of the glass, sometimes in the leers. I should like to see the situation reviewed and perhaps some conclusions reached.

Mr. Ford explained that they have not attempted to study this feature, but have simply studied the effect of moisture on the glass. That when

[1] Glass Division, Pittsburgh Meeting, Feb., 1923.

a rubber stopper was used the surface was more clear than when using a cork stopper.

Mr. G. V. McCauley stated that some time ago his plant had had trouble with bulbs which came back with a white formation on the inside and outside. He further stated that a half dozen men at his plant got together for the purpose of ascertaining where this came from, and that after a little investigation they traced it, as they thought, to the glue used for putting the two outside papers on the corrugated padding; that it comes out and affects the glass when this glue is moistened by water, steam, or the like.

Mr. A. Silverman stated that the silicic acids were very weak and that possibly the organic acids might be stronger than the silicic acids, which would account for the reaction.

R. R. Shively remarked that he had had experience with sulphuring of jars in leers, but that this deposit seemed to form as the jars cooled, as those taken out of the hot part of the leers did not show the deposit.

CHAIRMAN HOSTETTER:—Your statement is that an extreme oxidizing condition is desirable in your particular case.

The paper that appeared in the *Journal of the Society of Glass Technology* a year or two ago indicated that a reducing atmosphere for light glass was desirable, thus going back to the idea of having charcoal in the glory hole, all the time. The rings you describe on the jars: did they appear immediately as they were taken from the leer or glory hole?

R. R. SHIVELY:—From the leer, and they were not heavy.

CHAIRMAN HOSTETTER:—I have seen this phenomenon. As the ware was taken from the glory hole it would show signs of surface discoloration. They could be washed however. The lines would show up under the action of water.

R. R. SHIVELY:—I have noticed a ring formed on the ware warmed in a glory hole fired with gas containing sulphur. This was eliminated by running an oxidizing flame. After washing this ware, these rings were more pronounced.

DISCUSSION ON "A STUDY OF THE ORIGIN AND CAUSE OF STONES IN GLASS"[1]

A MEMBER:—Is it possible to add material which may cause the glass to boil in the melting end of the tank and may tend to keep the scum down or remove it after it is once formed?

H. E. INSLEY:—Any action which would bring materials of higher specific gravity to the surface would probably remove the scum. The addition of salt cake to the melt might also remove the scum.

[1] H. E. Insley, *Jour. Amer. Ceram. Soc.*, **6** [6], 706 (1923).

R. J. MONTGOMERY:—We often had white surface scum, but we have cleared this up. We broke up that surface. We have been able to improve the quality immensely by stirring.

A. E. WILLIAMS:—What are the different ways in which corundum may be formed in the glass furnace?

H. E. INSLEY:—In the case of the formation of corundum on clay blocks above the glass surface, there must be excess of alumina. After the absorption of soda from the furnace atmosphere and the formation of the sodium aluminum silicate which is liquid at furnace temperatures, the excess of alumina will crystallize as corundum. In the case of the formation of corundum in flint glass not exposed to the soda in the furnace atmosphere, there is often direct conversion of the dehydrated gibbsite or diaspore to corundum.

H. W. HESS:—Some years ago, not being very familiar with this type of work and hunting for the causes of stone in heavy glass, I had to seek aid from the outside. We took an ordinary pot holding about three thousand pounds of glass and introduced fragments of pot clay of various sizes and closed up the pot, and after two days I took out samples and examined them and then compared them with stones that they had found in glass in process of manufacture. We closed the pot up again for several days and kept that procedure up, just holding this one pot for that type of work until the stones gradually disappeared, and we found a long line of threads where the crystals were carried away by movements of the glass although the inner structure had entirely disappeared. Experimenting along that line, as regards stirring, while stirring the entire crystal structure disappeared. Some of these experiments were carried over four weeks, and I have wondered whether such work was being done. That gave me a great deal of information that I had not been able to gain otherwise.

H. E. INSLEY:—That is the kind of work we want to do at the Bureau later. So far we just have examined stones sent into us. We would be glad to examine any forms of crystalline material sent in to us. We are very anxious to have samples of any kind of stones.

M. G. BABCOCK:[1]—The writer has seen several samples of stony glass which appeared on first analysis to be clay pot stones. In the particular factory where this occurred, they were melting a fairly heavy lead potash glass batch in covered pots. A part of the K_2O in the batch was obtained by substituting some niter in place of all potash. Instances were noted on several occasions when the pot planed up and the stopper removed, that the gathered metal was full of small stones, making the pot unfit to work. However, by stoppering the pot for another twenty-four hours, the stones disappeared. On first inspection, this type of stone had all the earmarks of a clay pot stone, but the very fact that on the second day it had dis-

[1] Written discussion received April 20, 1923.

appeared, proved to the writer beyond all question that these stones were not from the pot but were batch stones.

In many factories clay pot stones are made more numerous and objectionable by the rather common practice of scraping pots. It has been the writer's experience to note that pots which were scraped on Saturday afternoon and were opened up on the following Monday for working the glass, invariably would be stony. The reason for this condition being that the bottom of the pot is cooler and the glass in this region is more viscous, thereby keeping small clay points from the gathering pipe. But should one stir up this metal by scraping, the viscous glass would pull off many protruding particles of the eroded pot and hence many minute refractory pieces would become a part of the next melt, thereby forming numerous stones, these stones becoming evident as the glass is gathered for presser or blower. This condition exists mainly in pots that have been in use for some time.

The subject of pot stones is one which is most important both to the glass manufacturer and the maker of pots. It is a recognized fact that at this writing the pot maker has been unable to find clays or combinations of clays which will entirely eliminate all of the stony glass problems coming from the pots themselves. On the other hand the user of pots may decrease his stony glass troubles by closely watching the effect of his batch materials, the burning of his pots to a high temperature before glazing, and, by being most conservative in following the practice scraping pots.

DISCUSSION ON "SILICA CEMENT"[1]

F. A. Harvey:—Mr. McGee's paper brings out in a very clear manner the importance of silica cement. Comparatively few users pay any attention to the quality of silica cement as long as the boss mason is satisfied and he usually wants a smooth working cement and asks for nothing more.

I should like to emphasize Mr. McGee's point that the softening temperature or fusion point is very easily and quickly determined by the A. S. T. M. standard method. Also it gives much more reliable results than chemical analysis. Alkalies have much greater effect in lowering the fusion point than does a change of one or two per cent in the alumina content. A decrease in the lime content by using raw rock instead of bats will raise the fusion point several cones.

Chemical analysis is of no value whatever unless the total fluxes are considered and even then it has no purpose except to control the fusion point. So why not make this test in the first place.

[1] E. N. McGee, *Jour. Amer. Ceram. Soc.*, 6 [8], 896 (1923).

The per cent of clay is quickly determined by finding the per cent weight lost and heating the cement to red heat and comparing it with the per cent weight lost by a sample of the raw clay used in the mixture after heating. This method is much more rapid than the chemical analysis and just as reliable.

It is doubtful whether there is any advantage gained in trying to balance the shrinkage of the clay by the expansion of raw rock. The real advantage gained by using rock is the higher fusion point.

DISCUSSION ON "MOLD SHOP PRACTICE"[1]

W. D. GATES (Acting Chairman):—The departure from the old method of secrecy as shown by Mr. Klinefelter is an excellent point in his paper.

SECRETARY CLARE:—Mr. Klinefelter made the statement, that it is cheaper to throw up a mold than it is to cast it. We find that casting gives a much more solid mold, more fool-proof, and it lasts longer. I do not know but what it is about as cheap.

There is also a question of making a cast mold for plaster pieces. That is quite expensive. We should have to consider there whether it would pay even to make a piece mold although I think it would.

The paper on the Miter Cutter Department is the first instance of a paper of this type. That is rather a neglected department and one where a lot of unnecessary money is spent. In most cases in the Miter Cutter Department they do as Mr. Klinefelter says: "They stick a soft piece on to a hard piece and they get unequal shrinkage resulting in a crack, or too hard finish." My plea has been to reduce cutter material to a minimum, except where it is too costly.

I think it is a very crude practice to work on pieces in a semi-shrunk condition. We do not know just how much shrinkage it has had, sometimes it has been pressed four hours, sometimes 10 hours, and sometimes 2 days. This shows that this department could bear much thought and investigation. I have been able to pick out miter cutter pieces on a building by just looking at the take-up.

T. A. KLINEFELTER:—On piecework one mold maker can usually take care of four to six pressers week in and week out without a bit of difficulty.

ERNEST CLARK:—I have discovered that cast molds stand up. I had a continual run of molds coming back from the pressing shop and I decided that the best was the cast mold.

On a double-ended miter we put what we ordinarily know as sides on first, then the two ends and you would be surprised what difference it

[1] T. A. Klinefelter and F. C. Parsons, *Jour. Amer. Ceram. Soc.*, 6 [7], 783, 786 (1923).

makes. We did have some trouble on account of the depth and a few years ago we used to try to save as much ending as possible.

We made a rabbet all the way from 1/2 to 3/4-inch and that caused the cracking which you mentioned. We reduced that rabbet to 1/4-inch for a cornice piece and have not seen a cracked piece from that time on. It eliminated all the trouble.

A man who is practiced in throwing up a mold can throw it up quicker than he can put up parts, but the plaster mold loses its strength. I believe that the cast mold is the most substantial and the cheaper mold in the long run, especially on big jobs where there are many runs on the same mold.

We have very little trouble with our miters, but invariably if you do not have plenty of room to reinforce the corner it is going to use itself up because in the drying there is not enough clay there to hold the pieces together and it will invariably crack.

I think that in everything Mr. Klinefelter has shown there is good. We have tried to follow that practice right along and our men have gradually got into that way of working and we have very little trouble. The mixing of the plaster has a great deal to do with it.

CHAIRMAN A. F. HOTTINGER:—We have all grown accustomed to these big rabbets. It seems to be very nice providing space for an amount of mortar between the two pieces of sufficient thickness that it will make a strong structure. But as a matter of fact this is all lost in the setting of the terra cotta. The rabbet weakens the face of the piece and no mortar of any consequence is put in, the rabbet not being filled. Any expansion or contraction (contraction particularly) brings a strain. Of course, the depth of the rabbet is of advantage where you have to grind the piece but you will have to grind no more off the piece if the rabbet is more shallow.

DISCUSSION ON "TRANSPARENT ENAMELS"

LED BY THOMAS A. WRY

T. A. WRY:—I should like to obtain a highly-polished steel surface and have on that surface an enamel that will not impair the reflecting-power of the surface and will withstand weathering conditions.

R. R. DANIELSON:—During the war the Government was interested in a large reflector that would not be affected if hit by a bullet. We attempted to enamel silver at that time and attempted to get the same results as you did by forming a polished silver surface. We were not able to get what we were after. The coating of glass on the silver surface cut down the brilliancy. I am inclined to think it is impractical to do it.

R. D. LANDRUM:—I understand in Europe there is such an enamel on

steel. We all have gotten certain glazes that would adhere to the steel and show the steel through.

H. F. STALEY:—It is a difficult proposition. In order to have the enamel stick to the steel you must use a ground coat which tends to dissolve the surface with more or less corrosion whereas in order to get a mirror-like effect you have to have a highly polished surface. In other materials, for instance, in gold, they do that. You can see the material right through the enamel. Perhaps Mr. Wry could solve the problem by trying some other material. All transparent enamels on steel which I have attempted to burn have turned more or less black.

DISCUSSION ON "ZIRCONIA IN ENAMELS"[1]

A MEMBER:—Was that commercial zirconium?

W. F. WENNING:—In the white enamels tests we used pure zirconium and not commercial zirconium.

H. C. ARNOLD:—How did the substitution of zirconium oxide for tin oxide affect the fusibility?

W. F. WENNING:—The fusibility was increased.

H. C. ARNOLD:—Did you get greater acid resistance when the zirconium was added in the mill, in the batch, or both?

W. F. WENNING:—The greater resistance was noted particularly in the batch additions.

H. C. ARNOLD:—That checks our experience. When added on the mill the resistance depended more on the resistance of the gloss.

E. P. POSTE:—What did you mean by higher fusibility?

W. F. WENNING:—Increased refractoriness.

W. J. VOLLRATH:—How did a small quantity affect it?

W. F. WENNING:—It went from one up to 10%, and the fusing point was not affected in batch replacements.

H. F. STALEY:—You said the objection to zirconium oxide was the high price. Is the price prohibitive?

W. F. WENNING:—Yes. The price prevents it being used in commercial enamels.

H. F. STALEY:—How cheap can pure zirconium oxide be produced at the present time?

F. R. GLENNER:—I do not think we are quite in a position to state what the exact price would be at the present time, but we are working on the problem and we think we shall in a short time be able to produce material analyzing over 99% in purity at a price very close to that of tin oxide. Our present production leads to this conclusion. This is of great importance to enamelers.

[1] W. F. Wenning, *Bull. Amer. Ceram. Soc.*, **2** [5], 102 (1923).

W. F. WENNING:—Have you any idea what pure zirconia sells for now?

F. R. GLENNER:—We are able to produce it now at a price close to seventy cents per pound but, as previously stated, it will have to be about equal to the price of tin oxide at the present time, if it is to compete with the latter, as it replaces it pound for pound. That seems to be brought out in Mr. Danielson's report. We feel thoroughly confident of bringing down our cost with increased production to enable the enameler to replace tin oxide with zirconia.

B. A. RICE:—How did you test the elasticity of the enamel?

W. F. WENNING:—We enameled pieces of sheet metal twenty gage, 3 inches by 5 inches. They were bent over a specially devised jig. Enamels that would crack while bending through small angles were considered to have low elasticity, while those enamels which could be bent through greater angles were considered to have greater elasticity or stronger.

B. A. RICE:—How were they bent?

W. F. WENNING:—By hand. The adhesion in turn was tested in a similar way. Those enamels which jumped off the iron while being bended were considered to have poor adhesive qualities.

F. J. JAEGER:—Do you not get an entirely different result in the bending according to the quantity of enamel applied?

W. F. WENNING:—We applied a uniform quantity on all tests. We were aware of the fact that various thicknesses would vary the results. We used only one coat in most tests.

J. A. AUPPERLE:—Did you test out the zirconium enamel for acid resistance?

W. F. WENNING:—We compared the acid action on the zirconium enamels to acid action on other enamels relatively.

M. E. MANSON:—I had samples of two different concerns. Each said they had zirconium oxide, but they really had zirconium hydrate. Was your material zirconium oxide or zirconium hydrate?

W. F. WENNING:—We used pure zirconium oxide.

F. R. GLENNER:—It would be quite enlightening in the application of zirconium oxide if Mr. Danielson would follow up his tests with data showing the success of pure ZrO_2. I should judge that the closer you get to 100% purity, the better would be the results in the enamel. It would be interesting to see how that worked out in practice.

R. R. DANIELSON:—The tests were made some time ago when it was difficult to obtain the pure zirconium oxide.

H. C. ARNOLD:—In literature I have seen a number of references made to basic zirconium silicate, especially in foreign literature. I wonder if any one has had any experience in using basic zirconium silicate.

L. J. MUNROE:—I had some experience, but it was not of a pure grade.

Any man almost can use tin oxide with safety. Zirconium seems to take more technical skill. My experience shows that I had to be more careful in burning than was the case in tin oxide. But I am not present to say what can be done with zirconium.

A MEMBER:—There is one point I do not understand. Why does zirconium oxide have to be so pure? Why could we not use the ore and take out the materials that would cause discoloration and have for use about 85% zirconium oxide?

L. J. MUNROE:—At the smelters that could perhaps be done, but in the enamel plant I do not believe that it would be practical.

F. R. GLENNER:—Has Mr. Danielson data on titanium in connection with zirconium oxide? Perhaps even a small percentage of titanium would affect the results.

R. D. LANDRUM:—There is very little data on the subject and I think it would be well if some of the committee would work with it and give us their results.

Every ounce of tin oxide we add makes it less enamel, for the tin does not go into solution. The few results that we have obtained with zirconia shows that though it may be an opacifier it also increases corrosion resistance. It is a point to be considered and upon which somebody should spend considerable research.

DISCUSSION ON "RELATIVE MAGNITUDE OF RADIATION AND CONVECTION IN A MUFFLE KILN"[1]

W. ROSENHAIN:—I am inclined to suggest, tentatively, that it would be desirable to be a little cautious in accepting the author's generalization because convection is not a constant thing; it depends upon the particular circulation of gas you have in your furnace. The amount of heat which the surface can absorb by convection is a function of several, one of which is the velocity at which the gas is moving, consequently it all depends where you place a cylinder like that as to how much heat it will absorb and what radiation you get. These figures are very interesting, yet I am not at all certain we will be safe in applying it equally.

In regard to the temperature of the water inside the cylinder, he tells by the amount of heat communicated to this how many calories per second are passing through the copper. I never worked this out, but there must be a difference of several degrees between the outside and inside. Certainly there is room for correction there.

J. T. LITTLETON:—Dr. Rosenhain's point in regard to the variation of convection in different forms of kilns and so forth is very true. I attempted

[1] J. T. Littleton, *Jour. Amer. Ceram. Soc.*, 2 [7], 771 (1923).

to bring that out in my statement. These data would only apply to this one particular kiln. The point of position of the surface subjected to convection heating, of course, is extremely important. In this case it was somewhere near the center of volume of the kiln, at a place where it was subject to a good average condition. The temperature gradient through the copper vessel was much less than 1 °C. However, as was pointed out the error would be negligible so far as radiation is concerned had it been ten degrees.

DISCUSSION ON "THE FLINT CLAY SITUATION IN PENNSYLVANIA"[1]

A MEMBER:—Is it agreed that the quarry rock is better than the ledge rock for ganister?

R. W. STONE:—Last summer I tried to cover as much of the state as possible. In 2400 miles, I saw no place where rock was being quarried for use as ganister. It was in every case the talus. That may simply be an economic proposition. It is easier to pick it up than to quarry it by the use of expensive explosives. The outcrop has been subjected to weathering sufficiently so that the soluble material has been extracted. There is little left but the silica and it is freer from iron.

CHAIRMAN J. S. MCDOWELL:—In our own experience in the quarrying of quartzite in Pennsylvania, I think it is true that the talus rock is almost invariably purer than from the solid measure, although there is a great deal of solid measure rock of high purity.

A. F. GREAVES-WALKER:—If that is the case, will not the talus rock be exhausted and the silica reduced to disappearing point within the next few years?

J. S. MCDOWELL:—I do not think so. There is sufficient talus to keep the brick works going for a long period of time and there are a good many of the solid measure deposits which are extremely pure. They probably will not be worked to any extent as long as the talus is as abundant and readily available as it is now.

R. W. STONE:—It seems that the talus in the immediate vicinity of Mt. Union, Pa., is rapidly being exhausted, but the formation, the Medina, outcrops all the way from the southern to the northern boundary of Pennsylvania, loops back and forth and repeats itself, and for a hundred miles the talus lies below the outcrop. I was particularly impressed by the great rock slides along the mountain-ridge with talus the whole length. Very little of this is at present time accessible to railroads. It means the building of tram roads to get to it. There is an enormous quantity

[1] G. H. Ashley, *Jour. Amer. Ceram. Soc.*, 6 [7], 837–49 (1923).

of talus of the highest grade to be obtained that will last the refractory industry of this state for many years.

F. A. HARVEY:—My own company and at least two others are using a large proportion of solid measure rock and have been for several years. We produce a very successful brick. As to the purity of the material, the best analysis which we have ever had, came entirely from solid measure rock. An analysis showed iron about $^{7}/_{16}$ of one per cent, and alumina considerably under one per cent. The greatest difficulty we find is that the solid measure rock is so hard that it wears the pan castings too fast in grinding. It is our ordinary practice to mix the talus with it to be able to grind the rock easier.

A MEMBER:—How much lime?

F. A. HARVEY:—There is about $^{2}/_{10}$ of one per cent.

H. INSLEY:—Do any of the flint clays of Pennsylvania contain diaspore nodules?

F. A. HARVEY:—Some of them do.

J. S. MCDOWELL:—How long are the flint clay deposits going to last?

R. W. STONE:—It is the impression that the deposits are comparatively scarce and it will not be many years until they will be much more valuable than they are now.

J. S. MCDOWELL:—Can you give us any data?

R. W. STONE:—The personal opinion of Dr. Ashley is that there are considerable sections of the bituminous coal measures and he is firmly convinced that there is a sufficient quantity of the flint clay and of the soft clay to supply the industries of this State for a good many years, which is a little bit more than the "many" he used for the talus. He has no fear that the producers in this state will be obliged to go outside of its boundaries for its refractory materials for a considerable time to come.

DISCUSSION ON "NOTES ON BURNING REFRACTORIES WITH SPECIAL REFERENCE TO CONTROL OF LABOR COSTS"

E. H. VAN SCHOICK:—How long has this system been in operation?

L. C. HEWITT:—Four or five years.

MR. ALLEN:—Mr. Hewitt, in your work did you find that a bonus system was sufficient incentive to get the men to be interested in it?

L. C. HEWITT:—Yes, but we had some trouble getting the thing over. We had actually to show the firemen that they could easily do the work with fewer men—the added earnings did the rest

MR. ALLEN:—We put the bonus system in our plant. We made a time study and found they were running, on an average, 50% efficient of what

[1] L. C. Hewitt, *Bull. Amer. Ceram. Soc.*, **2** [5], 109 (1923).

they could do and made that a basis of pay and found that by offering an inducement of $37\frac{1}{2}\%$ increase in pay for 60% increase in production they could go right after it. That is, for each 2% increase of production above fifty, the men would make one cent per hour more. Anybody on that basis could make some money. They found they could get a little bonus and do a little more work. We have had them get 80% on that basis. It has been particularly successful in hand molding and finishing. In some of the other operations where you have variable conditions like wheeling in clay when the clay is frozen, we have to change our rates to allow for that and it is rather questionable in that particular case. Of course, we have to allow for breakdowns in machinery. The men are not responsible for that. There is also a tremendous amount of work involved in this kind of thing and while it does speed up production, it remains to be seen whether it actually pays.

L. C. HEWITT:—It pays well in our particular instance.

E. H. VAN SCHOICK:—Have you had any experience with men who did not earn any bonus; men who were earning the bonus right along and for some reason, possibly not their own fault, they did not make it for one week.

L. C. HEWITT:—Yes. We went through a very heavy rain—almost amounting to a flood—necessitating extra labor far above normal. You have to allow for a condition of that kind.

E. H. VAN SCHOICK:—Where the men have been earning the bonus for any length of time, they come to think of that as their wage. If they do not earn the bonus, they have the idea that the company is cutting their wage and it is troublesome.

E. E. AYARS:—Do I understand, Mr. Hewitt, that you make allowance for abnormal conditions or force the men to make allowance?

L. C. HEWITT:—We allow for them—but allowances that are necessary are surprisingly few. The regular fatigue allowance takes care of many little things that come up. When some big abnormal condition arises, conditions are changed and you have to change your basis. We do not change the bonus system as long as the conditions remain as they were at the time the system was established, no matter how much the men make by increasing their efficiency. Increased earnings for the men means increased earnings for the Company. If the men desire to exert themselves above normal to earn bigger money, they need have no fear that the bonus will be cut, as is often the case in piece rates when a company decides that the rates are too high when the men go after higher wages in earnest. With the bonus system, a man can earn good money by doing a fair day's work. If he feels like going beyond that he can. The man who does more work will get more money.

A. HAYES:—Do you make any allowance for the variation in the time

of firing a kiln where they have from kiln to kiln a different type of ware, large slabs, pieces of heavy cross sections, etc.

L. C. HEWITT:—No, as explained in the outline, we have, in this particular example, four definite temperature ranges, 0–500°, 500°–1150°, 1150°–1400°, and 1400° to finish of burn. The standard man hours per shift for firing a kiln while it is in a particular stage is constant. Assuming that the standard is two-man hours per 12-hour shift for the range 0–500° and it takes 24 hours to take the kiln through this period, the standard would be 4 man hours. Likewise if on account of heavy pieces as you mention it was found necessary to take 48 hours in bringing the kiln up to 500° the standard would be eight man hours (4 times the constant standard for this range of two man hours per 12 hour-shift).

DISCUSSION ON "THE SLAG TEST" AND "THE ACTION OF SLAG UPON SILICA, MAGNESITE, CHROME, DIASPORE AND FIRE CLAY REFRACTORIES"[1]

R. F. FERGUSON:—The present slag test is a measurement primarily of penetration and the result of chemical action is largely obscure and very little information is obtainable except a measurement of the absorption of the brick. We hope to be able to develop a slag test which would measure the chemical action and eventually give practical information which would make it possible to predict beforehand the chemical action of a given slag on any refractories and we think we have at least partly accomplished this. The theory on which the test is based is simply this. When refractories are heated, compounds are formed with a low fusion point, and the extent to which this is lowered is taken to indicate the action of the slag on the brick. That is what happens in practice. The brick and slag in contact form a low melting compound, fuse and scour away. The method of procedure is simple enough. The refractories were ground until they were all of the same degree of fineness. In this case, it happened to be 80-mesh. The slags were finely ground and were mixed with the refractories. We mixed up batches of various kinds, with no slag, 4% slag, 8% slag, 16, 30, 40, and 50% slag. We investigated five different types of slag. These slags were brought in contact in these proportions which I have mentioned, with eight different kinds of refractories. Five different types of fire-clay brick, having a wide range of composition, were used. All the bricks selected were considered first quality bricks for the particular type of service for which they were used. The results are very encouraging. I have only picked out a few very representative results with which I will give you an idea of what the test will do.

[1] R. M. Howe, S. M. Phelps, and R. F. Ferguson, *Jour. Amer. Ceram. Soc.*, 6 [4], 589 (1923).

These tests, you notice, will agree with service conditions in three important respects. The fusion point depends upon the amount of slag present. Different slags behave differently with different refractories. With a given refractory, the action of the various slags is comparable. Also, with different slags, different refractories give different values. Consequently, with these three things in mind, we believe that the use of the test is justified, and that further study will give a great deal of valuable information on the effect of slag on refractories.

A. Krusen:—I should like to know what alumina content you would consider a diaspore brick. As I understood, that brick contained approximately 60% alumina and I wondered if that was a true diaspore or if a true diaspore would contain more than that amount.

L. C. Hewitt:—It might be stated that any brick which shows a predominance of diaspore crystals can rightfully be termed a diaspore brick. In Mr. Howe's discussion at St. Louis a year ago, it was also developed that we might expect a considerable range in the alumina content of various diaspores. The diaspore brick may also be made either from straight diaspore or from a combination of diaspore and bond clays.

E. N. McGee:—We made an investigation at Syracuse on the effect of lime at the fusion point and we ran across this thing that Mr. Ferguson has explained. With silica brick, the addition of lime did not decrease the refractoriness very much. Five per cent lime would decrease the refractoriness to about cone 28, while with clay, the ordinary fusion point would be about cone 12 or 13. I wondered at first what the reason for that was because if you take a brick and place it in the furnace, place lime on the brick and heat to 1350°, the lime will fuse right on the brick and all disappear.

ACTIVITIES OF THE SOCIETY

PRESIDENT'S PAGE

A CALL TO ACTIVITY

By President A. F. Greaves-Walker

An intensive effort to increase the membership is under way. Every Society officer, Section and Division officer, every committeeman and every member is asked to put his "shoulder to the wheel" and make this the greatest drive in the history of the Society. It is surprising how many there are who will join the Society if invited. So many of these are under the impression that they are not eligible.

A Michigan Section has been formed and started off auspiciously by acting as host to those attending the Summer Meeting. This Section is in the hands of some of the strongest and most enthusiastic members of the Society and its success is assured. The best wishes of the entire membership go with it.

Two Pacific Coast sections now seem assured, probably centering around Los Angeles and Seattle. There is a wonderful opportunity for local Sections on the Coast, especially as the members out there are so far removed from the center of activities that they must in a measure furnish their own contacts in order to derive the greatest benefit from the Society. The holding of the next Summer Meeting on the Coast will do much towards speeding up the necessary preliminaries to organization.

With the Summer Meeting over we begin to look forward to our Fall Meeting at the Chemical Show in New York in September. The success of this meeting is assured and it is expected that Ceramic Day, Sept. 19th will show the largest attendance in the history of this annual affair. The Committee on Papers and Programs are preparing an excellent program which will soon be announced.

WHY IS A CERAMIC SOCIETY?

By R. F. Ferguson

"Why is a policeman?" used to be a favorite conundrum in the days before the red tag system was invented. And we have just as much right to ask, "Why is a Ceramic Society?" We all know there *is* one, especially those of us who serve as officers and committeemen. But does it have any excuse for existing? Organizations have been known which were created because "there ought to be one." Does our Society come in this class? Do we get anything for our seven-fifty besides a card and a *Journal?* And those who have been selected or elected to keep the mails filled with blue tinted letters, are they the "goats" or do they derive a benefit from it other than typewriters' cramp and the reward Virtue is supposed to bestow? To answer these questions we must delve into the realms of psychology, a risky thing for a ceramist to do, undoubtedly.

Professor William James divides the self into three parts respectively: the material self, the social self, and the spiritual self. Furthermore, he claims that "a man has as many social selves as there are individuals who recognize him and carry an image of him in their minds." But these individuals naturally fall into groups and to each of these groups we show a different self. The Ceramic Society is such a group and one of its purposes is to develop our professional selves. And this professional self *must* be de-

veloped in most of us if ceramics is to be a life work and not a dreary way of making a living.

To the big boss I am one of the help; a doubtful bargain on the part of the payroll department; a necessary evil that must be added to the bug-a-boo overhead because not directly in line with production. To my neighbors I am a poor ass who wont buy his family a car; a good-hearted sucker who works hard for what he gets, and who doesn't know when his hair needs cutting and his tronsers need pressing. If these were the only Mes I had to live with, I would find myself poor company. The African explorer, world traveller, and heavy weight champion who used to tell me they would be waiting for me when I grew up are not to be found. The man my mother thinks I am has gotten too far away to be recognized.

But, now, in comes another Me. It is the image that the fellow members of the American Ceramic Society, present and future, carry in their minds and it brings much satisfaction, inspiration, and encouragement. It is a wonderful Me, of a delicate blue tint, with a copy of the *Journal* under each arm. An ardent searcher for truth who wishes nothing better than to uncover some obscure fact whereon other workers may build and which abstractors can tuck away in a card index. A Me whose name is already in that pantheon of our student days, the authors of the technical literature; an expert who knows the haunts of molecules and whose opinion is to be sought; an *ipse dixit* to the young student; a professional man who hews unflinchingly to the dead log of error and lets the stockholders dodge the chips. And this is the Me that takes the labor out of laboratory, the burning bush that makes my study holy ground. And this particular social self, this baby-blue Me, would not be possible without the American Ceramic Society.

NEW MEMBERS RECEIVED FROM JULY 16 TO AUGUST 15

Personal

E. B. Baker, 764 Military Ave., Detroit, Mich. (Star Grinding Wheel Co.)

W. H. Ball, Ball Bros., Muncie, Ind. (Ass't. Gen'l. Manager.)

Ellridge J. Casselman, University Club, Pittsburgh, Pa. (Industrial Fellow, Mellon Institute of Industrial Research.)

Leon B. Coffin, 310 Cayuga St., Syracuse, N. Y. (Onondaga Pottery.)

Thos. R. Davison, 187 Jennings Ave., Salem, Ohio. (The Salem China Co., Supt.)

Eldon B. Flu, % Champion Porcelain Co., Detroit, Michigan. (Chemist.)

Jno. M. Gibson, 120 North Park St., Edgewood, Wheeling, W. Va. (Foreman.)

W. S. Hamilton, Celito Products Co., Lompoc, Cal. (Sup't C—22 Brick Plant.)

F. Heinrich, Eisen & Stahlwerk Hoesch, Forschungsanstalt, Dortmund, Germany. (Director of the research dep't. of the Hoesch Iron & Steel Works.)

Everett Curtis Hunting, 326 Clark St., Olean, N. Y. (Student N. Y. State School of Ceramics.)

Fred P. Johnson, 335 W. Ave. 26, Los Angeles, Cal. (Stone Ware, Foreman.)

Oscar W. Kraft, 3350 Scotten Ave., Detroit, Michigan. (Ass't Superintendent.)

Cyril Kussman, % Favorite Stove & Range Co., Piqua, Ohio. (Foreman.)

Irving B. Laud, 70 W. Boylston St., Worcester, Mass. (Norton Company.)

Otto Oscar Malleis, 333 Melwood St., Pittsburgh, Pa. (Ass't Chief Chemist.)

G. H. Morton, % Los Angeles Pressed Brick Co., Alberhill, Cal. (Clay Mining Contractor.)

Andrew N. Outzen, % Detroit City Gas Co., Detroit, Mich. (Field Sup't Coast Sta. "J.")

Samuel Peacock, Suite 405 Wheeling Steel Corporation Bldg., Wheeling, W. Va. (Iron and Steel Technical Counsel.)

Edgar C. Rack, 26 Elizabeth Ave., Newark, N. J. (Engineer Gen. Insulation & Power Specialty Department.)

G. Ross, Saltillo Mexiko, Apartado 136. (General Manager.)

E. Roth, Zehren b/Meissen in Sachsen, Germany. (General Manager.)

Fred W. Runge, 23 Oxford St., Rochester, N. Y. (Chemist.)

Henry Holder Stephenson, 181 Jeanne Mance St., Montreal, Que., Canada. (Ceramic Chemist.)

C. S. Tietsworth, Celite Products Co., Lompoc, Cal. (Research Chemist.)

Ferdinand S. Van Doren, East Millstone, New Jersey. (Ass't Ceramist.)

O. C. Wahl, 622 S. Park Ave. (President and General Manager.)

Andres T. White, 34 Penn. Ave., Dover, N. J. (Foreman, Enameling Department.)

CORPORATION

Carr Lowrey Glass Co., Baltimore, Md. Carl G. Hilgenbery, Pres.

Dover Fire Brick Co., Cleveland, Ohio. F. C. Preston, Vice-Pres.

Fostoria Glass Co., Moundsville, West Virginia. Wm. F. Dalzell, Chemist.

Pangborn Corporation, Sand-Blast and Allied Equipment, Hagerstown, Md. Thomas W. Pangborn, Pres.

The Titanium Alloy Mfg. Co., Niagara Falls, N. Y. Andrew Thompson, Vice-Pres.

The loyal members of the SOCIETY who are assisting the Membership Committee in their continued efforts to obtain new members are listed below:

Name	Personal	Corporation	Name	Personal	Corporation
E. E. Ayars	1		Donald W. Ross	1	
B. M. Burchfiel	1		Edward W. Schramm	1	
H. T. Coss	2		J. H. Seasholtz		1
K. H. Endell	3		F. H. Sebring, Jr.	1	
R. F. Ferguson	1		J. B. Shaw	1	
J. W. Hepplewhite	2		Thomas A. Shegog	1	
Joseph W. Hoehl	1		E. Ward Tillotson	1	
Charles J. Hudson	1		Karl Turk	1	
H. J. Knollman	1		A. S. Zopfi		2
Jacob Lindley	1		Office	5	2
Frank S. Roberts	1				
				27	5
			Deductions (2 mo.)	7	0
			Net	20	5
				Total 32	
Total Net increase for July 16 to August 15				25	

1923 NET MEMBERSHIP RECORDS

		Personal	Corporation
January	12	1611	216
March	14	1710	223
April	14	1738	226
May	14	1775	233
June	14	1792	238
July	14	1808	244
August	14	1833	249
Net Gain (1923)		222	33
Same Period (1922)		220	49

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Albert S. Adcock, of Columbus is now living in Worcester, Mass.

Benjamin Alderson, of The American Bottle Co., Newark, Ohio, has recently been transfered to the offices of that company at Streater, Ill.

D. H. Applegate, Jr., asks that his address be changed to the Castleton Apts., St. George, Staten Island, N. Y.

P. S. Bachman, who has been in Wooster, Ohio, has moved to 222 E. Mulberry Street, Kokomo, Ind.

Robert A. Bautz, has moved from Murphysboro, Ill., to 120 W. Kinzie St., Chicago, Ill.

Marion W. Blair, is living at 614 N. 51st St. East St. Louis, Ill., Mr. Blair is in charge of the construction of a new plant for the H & R Mining and Mfg. Co.

A. B. Christopher, who has been with the Southern Brick Co., Jonesboro, Ark., is now with the Elk River Clay Products Corporation, Northeast, Maryland.

H. T. Coss, has recently taken a position with The Celite Company, Lompoc, Cal. Mr. Coss taught in the Ceramics Dept., Rutgers College, New Brunswick, N. J., last year.

Raymond T. Fesler, a graduate of the Ceramic Dept., at Ohio State University, this year is living at 222 E. Mulberry St., Kokomo, Ind.

John Fitzpatrick, of Cincinnati, Ohio, has moved to 39 Roebling Place, Niagara Falls.

E. B. Guenther, of the Harbison-Walker Refractories Co., has been transferred from the Pittsburgh office to Room 1987–208 So. La Salle St., Chicago, Ill.

P. A. Handke, has moved from 260 So. Academy St. to 351 W. North St., Galesbury, Ill., Mr. Handke is with the Purington Paving Brick Co.

L. C. Hewitt, of the Laclede Christy Clay Products Co., has moved to 4919 Lansdowne Ave., St. Louis, Mo.

G. S. Kennelley has moved to 3205 Philadelphia, W., Detroit, Mich. Mr. Kennelley formerly was connected with the American Refractories Co., of Joliet, Ill.

Spicer S. Kenyon, has moved from 321 First St. to 2214—15th St., Niagara Falls, N. Y.

J. M. Mallory, of the Central Georgia Railway Co., Savannah, Ga., gives 233 W. Broad St. as his Post Office address.

Midland Terra Cotta Co., of Chicago, Ill., has moved from the Lumber Exchange Bldg. to 105 West Monroe St.

Henry W. B. Perry, is living at 5900 Manchester, St. Louis, Mo.

Will A. Rhodes, formerly of the Chelsea China Co., New Cumberland, W. Va., is with Albert Pick & Co., 208–224 W. Randolph Street, Chicago.

W. A. Richeux, is associated with the Isolantite Co. of Amer. Inc., Bellville, N. J.

William Turner, Trenton Potteries Co., has moved to 1511 Brunswick Ave., Trenton, N. J.

Lawrence A. Vincent, has moved from Cleveland, Ohio, to 931 Homewood Ave., Zanesville, Ohio.

ADDRESSES UNKNOWN

Members of the AMERICAN CERAMIC SOCIETY are urgently requested to forward the correct addresses of the following persons whose Journals have been returned to the office of the Secretary as a result of an insufficient or incorrect address. The address given below with the name is the last one which appeared on the official files of the SOCIETY.

Arbentz, Fred J. A., Florentine Pottery Co., Cambridge, Ohio.

Austin, G. L., American Refractories Co., Joliet, Ill.

Baker, G. V., Penn Feldspar Co., Barnard, N. Y.

Bickel, Earl A., Postville Clay Products Co., Postville, Iowa.

Butterfield, Fred H., 4906 McPherson Ave., St. Louis, Mo. Crunden Martin Mfg. Co.

Byrnes, A. Marietta, 63 Anderson Pl., New Orleans, La.

Callaghan, J. P., % Teaque Hotel, Montgomery, Ala.

Cameron, C. V., Whiting-Mead Commercial Co., 2035 E. Vernon Ave., Los Angeles, Cal.

Darlington, Homer T., Box 736, Natrona, Pa.

Dolley, Dr. Charles S., Keramoid Mfg. Co., Fort Madison, Iowa.

Fujioka, Koji, Shofu Porcelain Mfg. Co., Kyoto, Japan.

Greenwood, John L., Lehigh Sewer Pipe & Tile Co., Lehigh, Iowa.

Henshaw, S. B., Libbey-Owens Sheet Glass Co., Charleston, W. Va.

Ichijo, Mokiji, % Japanese Ambassador, Hildbrandstr. 25, Berlin, Germany.

Ivery, Sidney H., 4432 Gibson Ave., St. Louis, Mo., Hydraulic Press Brick Co.

Johnson, J. William, 4148 Langland St., Cincinnati, Ohio, Clay Salesman, with National Sales Co.

Kitamura, Y., Shofu Kogo Kafushiki Kaisha (Shofu Industrial Co., Ltd.), Kyoto, Japan.

Knote, J. M., Mines Dept. L. S. Corporation, Sault Ste. Marie, Ont., Canada.

Leahy, T. Arthur, 5490 Ellis Ave., Chicago Ill., A. P. Green Fire Brick Co.

Marr, H. William, % Canadian Libbey-Owens Sheet Glass Co., Hamilton, Ont., Canada.

Mitchell, W. Leon, Rock Island, Ill., Rock Island Stove Co.

Moller, Chr. Y. Knud, 4956 McPherson Ave. St. Louis, Mo., Laclede-Christy Clay Products Co.

Nies, F. H., Hamilton Ave. and Summit St., Brooklyn, N. Y.

Okura, K., 84 Kobayashi-Cho, Nagoya, Japan, Japan Porcelain Corporation.

Pendrup, W., Coonley Mfg. Co., Cicero, Ill.

Peck, J. Clair, 4961 Neosho St., St. Louis, Mo., Laclede-Christy Clay Products Co.

Pohs, J. F., 1097 Interstate Ave., Portland, Oregon, Portland Stove Works.

Proodian, E. K., Newtown, Pennsylvania, Bucks Company.

Pulsifer, H. M., Manhattan Building, Chicago, Ill., Geo. H. Holb & Co.

Ragland, A. Nugent, 1280 West Adams St., Los Angeles, California, Alberhill Coal & Clay Co.

Reid, W. H., 10 Stanley Pl., Yonkers, N. Y., Consolidated Gas Co. of New York.

Rennieburgh, Cedric L., A. C. Spark Plug Co., Flint, Mich.

Thompson, E. J., 2507 Townsend Ave., Detroit, Michigan, Detroit Stove Works.

Villalta, John F. R., Apartado No. 65, Barcelona, Spain.

Vodick, William J., 1733 Lake Ave., Wilmette, Ill., Chicago Hardware Foundry Co.

Weidman, Frank E., 38 S. Dearborn St., Chicago, Inland Steel Co.

Winkleman, E. J., Pittsburgh, Pa., American Refractories Co.

THE 1923 SUMMER MEETING
TOLEDO—DETROIT—FLINT
AUGUST 8-11

In the memories and in the lasting impressions of one hundred and forty seven attending members, the 1923 Summer Meeting of the AMERICAN CERAMIC SOCIETY is now a valued and pleasant record.

In the special cars in which the party traveled the sixty miles from Flint to Detroit, eighty-eight were on their feet uncovered and at attention for five minutes on Friday at 4 P. M. in grateful memory and honor of Warren G. Harding. The cars were still, silence prevailed, thoughts and pulse beats alone continued on. The reflections of each during that brief while were of the unselfish and full-time service with which our departed president had won the personal allegiance and sympathies of men and women the world over. He was our faithful servant, faithful in all details of the trust of his official position. He shirked not, but labored with unusual diligence and prayerfulness. His is now a record of labor well done and richly compensated. He profited most because he served well.

Allegiance to and prayers for the success of our new leader, Calvin Coolidge is and will continue to be in the hearts of us all. We are going on with the same fortitude and hopes as before.

Sixty-nine persons were guests of the Toledo hosts on Wednesday, August 8th. Of these sixty-nine, nine were visiting ladies. Messrs. A. S. Zopfi and W. H. Hess extended the greetings for the Toledo manufacturers. They provided the automobiles, directed the routing of the different groups to the factories and were the hosts at a most enjoyable luncheon at the Toledo Yacht Club. The Edward Fords Plate Glass Co., the Owens Bottle Glass Co., and the Buckeye Clay Pot Co., threw wide open their factory doors to the party. Guides explained in detail the processes and process control. They invited questions and freely gave information.

Thirty-six of the party took the afternoon boat to Detroit. The day was ideal. The Maumee River teemed with commercial and pleasure boating. Lake Erie was calm. The most interesting was the Detroit River. This is a winding river broken by islands, and the banks of which are lined with richly developed estates and immense factories. Large heavily laden vessels of commerce and speeding pleasure yachts coursed the river's surface, and airplanes were in the air above. It was a superb and restful trip. Friendships were made and notes compared. A more profitable and pleasant "section Q" was never held.

The Detroit committee met the delegates at the wharf and at the trains with buses. On arrival at the Hotel Wolverine each delegate found that he was already registered and his room key in the hands of the local committee. It was in this attentive detail that the local committee cared for every want of the delegates throughout the entire trip. Morning room calls with information of the days schedule made for readiness to start each trip on the dot of the appointed hour. Thanks to Frank H. Riddle, chairman of the general committee and in charge of the Detroit excursions and to Taine G. McDougal and his assistants in Flint, every appointment was kept on scheduled time and yet with maximum comfort and attention to the desires of the delegates.

The program as announced was carried through in detail. It is only of four occasions that special mention will be given. Record has already been made of the delightful luncheon at the Toledo Yacht Club given by the Toledo hosts. Ninety-eight persons enjoyed a chicken dinner on Thursday noon given in the plant of the Champion Porcelain Co. Friday noon, seventy partook of a beefsteak luncheon given by the A. C. Spark Plug Co., in Flint. These three luncheons were enjoyed at the time but the courtesy and good will of the hosts will always remain in the memories of the guests.

Ninety-two persons sat down to a most excellent banquet Friday evening. The most memorable and profitable part of this Friday evening occasion was the illustrated talks by Mr. C. E. Ball of the Square D-Co. on "Modern Pottery Methods" and by Dr. J. A. Jeffery on "Tunnel Kiln Control Methods." The Square D-Co., manufactures insulators. They purchased an old factory and modernized its arrangement and equipment. The Champion Porcelain Co., under the technical direction of Dr. Jeffery has

adapted and adopted every known control devise whereby exact conditions of manufacturing and burning are at all times maintained. These two lectures were listened to with rapt attention and profit.

While it was no startling revelation, yet it was the frequent topic of conversation that each of these rival concerns, the Champion Porcelain Co., and the A. C. Spark Plug Co., should invite and cordially welcome the technical and operating men of their respective firms. The most cordial attention and freedom from restraint was extended by each of these concerns to the visiting men from its business rival.

This same cordiality and freely giving of manufacturing information even to exchanging of recipes was the rule without an exception in all of the enameling plants visited. The Detroit-Star Grinding Wheel Co., told of what and how grinding wheels were made. The Ford Co., not only gave the batch that was being used that day but gave detailed information on methods and cost of continuous pour plate-glass making. Ours was the first visiting party allowed in the new plate glass plant of the Ford Co., and here the visiting delegates from other plate glass companies were given especial attention some of them remaining longer to make a more thorough study of the novel and very successful method here employed. This freedom and welcome to delegates from rival concerns was particularly notable at all the plants visited.

All in all, the 1923 Summer Meeting was a huge success; efficiently conducted and productive of valuable information and valued friendships.

Notes

THE FORD PLATE GLASS BATCH

Sand	400.0
Soda ash	130.0
Limestone	118.0
Salt cake	24.0
Cullet	150.0
Arsenic	1.8
Charcoal	1.3

Attending Delegates

Mr. and Mrs. August Staudt, Miss Augusta Staudt, Perth Amboy, N. J.
Thomas A. Shegog, Sebring, Ohio.
George A. Balz, Perth Amboy, N. J.
George Simcoe, Trenton, N. J.
James A. Aupperle, Middletown, Ohio.
Mr. and Mrs. A. W. Kimes, Pittsburgh, Pa.
Mr. and Mrs. Frank G. Roberts, Baltimore, Md.
Ralph E. Seasholtz, Reading, Pa.
Mr. and Mrs. D. W. McNeil, Cincinnati, Ohio.
Carl G. Hilgenberg, Baltimore, Md.
Fred E. Jewett, Muncie, Ind.
L. E. Riddle, Jr., Metuchen, N. J.
Emery W. Jones, Perth Amboy, N. J.
Robert F. Ferguson, Pittsburgh, Pa.
Ralph F. Brenner, Rochester, Pa.
Charles J. Hudson, Worcester, Mass.
I. B. Laud, Worcester, Mass.
C. S. Linder, Creighton, Pa.
A. E. Korman, Kohler, Wis.
J. M. Lambie, Washington, Pa.
J. W. Wright, Charleroi, Pa.
R. Ellsworth Arnold, Pittsburgh, Pa.
J. C. Hostetter, Corning, N. Y.
R. T. Stull, Savannah, Ga.
E. T. Montgomery, Franklin, Ohio.
J. B. Lyon, St. Louis, Mo.
M. G. Babcock, Pittsburgh, Pa.
W. F. Godejohn, St. Louis, Mo.
F. A. Tobett, Middletown, Ohio.
D. M. Strickland, Middletown, Ohio.

Robt. A. Bantz, Murphysboro, Ill.
George Blumenthal, Jr., Chicago, Ill.
Mr. and Mrs. W. L. Brownlee, Toledo, Ohio.
L. L. Hunt, New York City.
Amory Houghton, Corning, N. Y.
Elza F. Heistand, Muncie, Ind.
Fred Carder, Corning, N. Y.
Mr. and Mrs. D. A. Cable, Canton, Ohio.
Mr. and Mrs. L. W. Mercer, Peru, Ind.
A. S. Zopfi, Toledo, Ohio.
David B. Gibson, Chicago, Ill.
A. G. Wikoff, New York.
E. E. Ayars, Joliet, Ill.
Robert, F. Sherwood, Syracuse, N. Y.
D. E. Foley, Chicago, Ill.
G. W. Batchell, Toledo, Ohio.
F. L. Steinhoff, Chicago, Ill.
J. W. Cruikshank, Pittsburgh, Pa.
Chas. O. Grafton, Muncie, Ind.
O. H. Day, Cleveland, Ohio.
F. A. Bailey, Toledo, Ohio.
L. E. Ells, St. Louis, Mo.
Gordon Klein, Springfield, Ill.
W. H. Hess, Toledo, Ohio.
Francis C. Preston, Cleveland, Ohio.
W. M. Clark, Cleveland, Ohio.
Fred B. Garrod, Toledo, Ohio.
Mr. and Mrs. M. A. Gesner, Ridgewood, N. J.
O. N. Earl, East Liverpool, Ohio.
F. H. Riddle, Detroit, Michigan.
James L. Jensen, Brooklyn, N. Y.
Thomas S. Mann, Portland, Oregon.
Leslie Brown, Trenton, N. J.
D. P. Forst, Trenton, N. J.
J. A. Williams, Trenton, N. J.
Jos. Schermerhorn, Trenton, N. J.
A. P. Ball, Detroit, Michigan.
H. H. Sortwell, Trenton, N. J.
A. T. Fenton, Trenton, N. J.
G. W. Lapp, Le Roy, N. Y.
F. H. Hastings, Hartford, Conn.
Ira E. Sproat, New York City.
J. H. Forsyth, Cleveland, Ohio.
T. W. Black, Oshawa, Ont. Canada.
R. M. King, Maryville, Tenn.
V. A. Stout, New York City.
J. S. Halvert, New York City.
Mr. and Mrs. J. W. Wenning, Pittsburgh, Pa.
H. W. Weber, Pittsburgh, Pa.
Theo. Lenchner, Pittsburgh, Pa.
H. T. Bellamy, Chicago, Ill.
Mr. and Mrs. Wm. K. Lucktenberg, Zanesville, Ohio.
Leroy F. Hobert, Sandusky, Ohio.
F. Gelstharp, Pittsburgh, Pa.
Wm. V. Knowles, Chicago, Ill.
A. Thompson, Niagara Falls, N. Y.
C. J. Kinsie, Niagara Falls, N. Y.
F. Merian, Pittsburgh, Pa.
C. S. Hahn, St. Louis, Mo.
Mr. and Mrs. Homer F. Staley, New York.
W. H. Ball, Muncie, Ind.
G. S. Kennelley, Detroit, Michigan.
F. W. Dinsmore, Trenton, N. J.
H. M. Kraner, Flint, Michigan.
T. G. McDougal, Flint, Michigan.
S. J. McDowell, Flint, Michigan.
P. D. Helser, Flint, Michigan.
H. F. Royal, Detroit, Michigan.
Robt. Twells, Jr., Detroit, Michigan.
R. W. Green, Detroit, Michigan.
B. A. Jeffery, Detroit, Michigan.
C. R. Moore, Detroit, Michigan.
T. R. Harrison, Detroit, Michigan.
P. G. Schad, Detroit, Michigan.
J. T. Littleton, Jr., Corning, N. Y.
F. B. Felton, Detroit, Michigan.
F. H. Williams, Buffalo, N. Y.
Geo. Dougherty, Reading, Pa.
H. S. Freeman, Detroit, Michigan.
R. C. Purdy, Columbus, Ohio.
Philip Dressler, Cleveland, Ohio.
L. E. Jeffery, Detroit, Michigan.
E. B. Flu, Detroit, Michigan.
E. B. Baker, Detroit, Michigan.
Frederick E. Bausch, St. Louis, Mo.
Harry Bill, Detroit, Michigan.
W. C. Stief, Mt. Clemens, Mich.
C. E. Doll, Jr., Mt. Clemens, Mich.
D. L. Rouleau, Mt. Clemens, Michigan.
C. E. Bales, Louisville, Ky.
A. O. Bragg, Kalamazoo, Michigan.
J. A. Jeffery, Detroit, Michigan.
J. L. Graham, Detroit, Michigan.
R. D. Landrum, Cleveland, Ohio.
John R. Kempf, Detroit, Michigan.
Richard H. Turk, Baltimore, Md.
George F. Lang, Baltimore, Md.

FALL MEETING OF THE SOCIETY

Wednesday, September 19, is the date. Grand Central Palace, New York City, the place.

Exposition of the Chemical Industries, the occasion.

A program of technical papers will be given in the afternoon Wednesday the 19th. This program, however, will not be the whole reason why one could afford to spend time and money to attend this meeting. The Exposition furnishes opportunity to acquaint one's self with sources of raw and prepared materials; with the very latest methods of and equipment for manufacturing, and with precision control methods and instruments. It also gives opportunity to meet those who are producing materials and equipment.

We know of one Ceramic concern which has profited many times the expense of sending three or four of its employees to this exposition because of the new processes and equipment which their men saw at the Exposition and which the concern has adopted.

This is a splendid opportunity to learn of the best and to get acquainted with the most helpful.

September 19, Grand Central Palace.

NOTES AND NEWS

THE FOURTH CONFERENCE OF THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

The International Union of Pure and Applied Chemistry met in Cambridge, England, June 17 to 20, 1923, under the presidency of Sir William Pope. The meeting was attended by delegates from 20 countries.

The Committee on Ceramic Products made the following report which was adopted by the Union:

(1) The Union recommends that, for technical and scientific purposes, the term "ceramic" be employed in connection with all industries manufacturing the following products:

Here follows the list which appears in the report of the American Ceramic Society's Committee on Definition of the Term "Ceramic."[1]

(2) The Committee recommends that there be established in each country an exact nomenclature of terms used for ceramic raw materials and manufactured products, together with exact definitions of such terms.

(3) The Committee unanimously agreed to place upon the agenda of the next meeting of the Union the question of the selection of typical or standard raw materials which could be employed for the purpose of studying the chemical and physical properties of refractory earths as well as proposed methods of testing.

(4) The Committee approved certain recommendations of M. Henry Le Chatelier and of M. Capsa concerning a proposed coöperative investigation to be carried out by the various ceramic laboratories of the world, but it suggested that the proposed study be executed on selected samples of the same set of raw materials in order that the results obtained should be strictly comparable. The Committee also expressed the opinion that the various laboratories should, if possible, reach some agreement as to apparatus for determining coefficient of expansion.

(5) The Committee expressed the hope that Prof. Henry Le Chatelier would accept the general direction of the proposed coöperative investigation in order to insure the proper coördination of effort.

[1] See *Jour. Amer. Ceram. Soc.*, **3** [7], 526 (1920).

THE NATIONAL LIME ASSOCIATION—ORGANIZED FOR EXTENSIVE RESEARCH WORK

The National Lime Association at its Annual Convention in June, has adopted a plan of organization which assures the continuation of its growing program of technical and research work and established a stability to the National organization which will make possible to establish and follow through to conclusion problems of research for the general benefit of the industry.

The National Officers and Board of Directors remain as the controlling body, directing the entire research and trade promotional program of the industry, but for the purpose of assuring a continued source of income for all departments of the Association and adding more flexibility to the local field promotional work, the program has been divided into two separate departments; first, the National program of technical research, publicity and National promotion; second, local trade promotional work by men in the field, sub-divided and directed from two Division offices with headquarters located at Washington and Chicago.

The members of the Association have agreed on basis of dues for a period of two years, which will afford the National program of technical research work a larger working budget than has been heretofore available, and the members in both the Eastern Division and the Central Division have agreed on a basis of additional dues which allows for a considerable increase in local field promotional work in the two Divisions.

The Lime Association loses the able leadership of Mr. Charles Warner, who has served as its President for the last four years, and who has been primarily responsible for bringing the work of the National Association to its present high standard.

The new President, Mr. George B. Wood, is President and General Manager of the Rockland and Rockport Lime Corporation, of Rockland, Main. He is a technically trained engineer, having received his degree from the Massachusetts Institute of Technology, has been an active Director of the National Association, and has added much to the lime industry in the way of technical advancement. He is a most enthusiastic believer in the future growth of the lime industry as the result of technical research and development, and is happily chosen as a successor to Mr. Warner.

Mr. William R. Phillips, the former General Manager of the Lime Association, has resigned to take the position of Vice President and General Manager of the American Lime & Stone Company. The Headquarters Office and organization is now working under the management of Mr. Burton A. Ford, Acting Secretary, who carries along the work well qualified by his experience during the last year as Mr. Phillips' assistant at the Washington office. Mr. Ford is a technically trained man, receiving his degree from the University of Maryland. Prior to joining the Association staff he was a Division Manager of the Virginia-Carolina Chemical Company and Secretary-Treasurer of the Bryant Fertilizer Company.

Dr. M. E. Holmes has resigned from the technical staff of the Association, and Dr. G. J. Fink has been appointed Chemical Director. Dr. Fink is a graduate of Wabash College and was for six years instructor in Chemistry at Cornell University, where he received his Ph.D. degree in 1914. He was also Professor of Chemistry at Iowa State College, and for five years prior to coming to the Lime Association was Research Chemist for the Hooker Electrochemical Company. Dr. Fink has been with the Association staff for two years, and is well qualified to assume the direction of the chemical and research problems.

In addition to work at the Association Laboratory in Washington, the Lime Association is supporting at the present time fellowships in five leading technical institutions where various special problems of investigation and research work are being carried through to conclusion. Coöperative relations also exist with other institutions where

important research on lime problems is being conducted. The increased budget for this class of work will make possible, under the two year program, the completion of the many problems on hand, and the inclusion of new important problems.

The personnel of the National Lime Association is as follows:

President	George B. Wood	Rockland, Maine
Vice-President	Fred Witmer	Woodville, Ohio
Treasurer	Milton McDermott	Knoxville, Tenn.

Board of Directors:

A. N. Griffing	Danbury, Conn.
C. J. Curtin	New York, N. Y.
George LeGore	LeGore, Md.
O. J. Vanderpool	New York, N. Y.
Warner Moore	Richmond, Va.
J. J. Urschel	Toledo, Ohio
F. M. Pinnegar	Cleveland, Ohio
Morgan Curtis	Petoskey, Mich.
B. L. McNulty	Chicago, Ill.
Col. C. W. S. Cobb	St. Louis, Mo.
R. C. Brown	Oshkosh, Wis.
J. M. Gager	Chattanooga, Tenn.
J. F. Pollock	Kans. City, Mo.
H. Dittlinger	New Braunfels, Tex.

Headquarters Staff:

Burton A. Ford	Acting Secretary
R. C. Towles	Office Manager
Dr. G. J. Fink	Chemical Director
W. A. Freret	Consulting Engineer
J. A. Slipher	Soil Technologist
R. P. Brown	Construction Engineer

Eastern Division — Division Office — Washington, D. C.

Henry M. Camp	Division Manager
R. C. Parker	Agronomist
W. F. Campbell	Construction Engineer
W. F. Beyer	Construction Engineer
W. D. Steward	Construction Engineer

Central Division — Division Office — Chicago, Ill.

G. B. Arthur	Division Manager
L. B. Burt	Chemical Engineer
A. B. Giett	Construction Engineer
W. H. Magee	Construction Engineer
C. O. Dowdell	Construction Engineer
A. C. Hamilton, Jr.	Construction Engineer
L. E. Johnson	Construction Engineer
O. A. Wakeman	Construction Engineer

GOVERNMENT ADOPTS STANDARDS FOR WHITE CHINA[1]

Three standard sets of chinaware for government use were agreed upon at a joint meeting of the vitrified chinaware manufacturers' committee and the Committee on China and Glassware of the Federal Specifications Board held recently at the Bureau of Standards. The sets adopted are: one-half thick chinaware for enlisted men's dining service as used in the Army, Navy, and Marine Corps; vitrified hotel chinaware for all government dining room service and hospital service where desired; and one quarter thick vitrified chinaware for hospital service. Drawings of the different articles are now being made so that each purchasing department and manufacturer can be supplied with a set of blueprints.

Those present at the meeting were: F. Sutterton, Maddock Pottery Co.; W. L. Huber, Onondaga Pottery Co.; L. H. Bown, Buffalo Pottery Co.; A. L. Goulding, Warwick China Co.; C. W. Read, Shenango Pottery Co.; J. A. Egleston, Fleet Corporation; G. A. Bentley, Quartermaster Corps; R. D. Kinsey, U. S. Public Health Service; B. Puryear, U. S. Marine Corps; A. E. Williams, Bureau of Standards; R. F. Geller, Bureau of Standards; F. Hazelwood, Bureau of Standards.

CALENDAR OF CONVENTIONS

American Association of Iron and Steel Electrical Engineers—Buffalo, N. Y., September 24–28, 1923.

AMERICAN CERAMIC SOCIETY (Annual Meeting)—Atlantic City, Feb. 4, 5, 6, 7, and 8, 1924.

AMERICAN CERAMIC SOCIETY (Exposition Meeting)—New York, September 17–22. Wednesday, September 19, is Ceramic Day.

American Chemical Society (Fall Meeting)—Milwaukee, Wis., September 10 to 14, 1923.

American Electrochemical Society (44th Meeting)—Dayton, Ohio, September 27–29, 1923.

American Face Brick Association (Southern Group)—West Baden, Ind., November, 1923.

American Gas Association—Atlantic City, October 15–20, 1923.

American Institute of Electrical Engineers—Del Monte, Calif., October 2 to 5, 1923.

American Society of Sanitary Engineers—Davenport, Ia., September 10–13, 1923.

Common Brick Manufacturers of America—Los Angeles, week of Feb. 11, 1924.

National Exposition of Chemical Industries—New York City, September 17–22, 1923.

National Safety Council—Buffalo, N. Y., October 1–6, 1923.

New York Hotel Association—New York City, November 19–24, 1923.

Power and Mechanical Engineers—New York City, December 3–8, 1923.

[1] Received July 26, 1923.

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

F. H. Rhead, H. S. Kirk — Art
H. F. Staley, R. R. Danielson — Enamel
A. R. Payne, A. E. Williams — Glass
E. E. Ayars, R. F. Ferguson — Refractories
F. H. Riddle, C. C. Treischel — White Wares
A. F. Hottinger, R. L. Clare — Terra Cotta
R. B. Keplinger, A. P. Potts — Heavy Clay Products

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Helen Rowland, Assistant Secretary
Emily C. Van Schoick, Assistant Editor
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Kier Fire Brick Co., Pittsburgh, Pa.
B. E. Salisbury
Onondaga Pottery Co., Syracuse, N. Y.
R. R. Danielson
Beaver Enameling Co., Ellwood City, Pa.

Vol. 2 October, 1923 No. 10

EDITORIAL

OPERATIVES INSTITUTE OF REFRACTORIES MANUFACTURERS

In the *Bulletin* section of this issue of the *Journal* is an account of an Institute organized for and by plant operators under the general sponsorship and guidance of the Refractories Manufacturers Association. Particular attention is drawn to this for in the first place it is an educational enterprise the like of which every trade association should sponsor. In the second place the American Ceramic Society would be remiss in its obligations if it did not give encouragement and assistance in the establishing and maintaining of every workable scheme of extending educational opportunities to plant operators.

Extension work by Universities among farmers and housewives has been developed during the past two decades with large benefits accruing. It is not for social purposes, but because of an earnest desire to learn of the most profitable ways and means on the farm and in the home that institute meetings are held in the rural districts in every State in the Union. This bringing to the land and home toilers the fundamentals as developed in the laboratories and taught in the Universities reacts beneficially on the educational and research institutions, for it focuses attention onto the most urgent problems.

Progress can be had only through production of things that are necessary to comfortable and profitable living with less human effort and financial expense. The farmer is forced to this as is the housewife. The operators in ceramic plants have the same need. They may not realize it. They may think the need of and benefits from all these educational enterprises are for the employers' profit alone, without realizing that progress in manufacturing is possible only through improvement in the manner of doing factory work and that the plant which progresses most furnishes the most profitable and pleasant opportunities for employment. The keystone to industrial progress, profit and pleasure rests with the operators and when the operators are being served and are serving according to the best information extant all coöperating parties are benefited.

The example set by the Refractories Manufacturers' Association is recommended to all ceramic trade associations for careful consideration, for the conducting operator institutes will bring returns far in excess of their cost.

To the Ceramic Departments of Universities these institutes are commended as exceptional opportunities for extending their influence beyond the lecture halls and laboratories. No more fruitful opportunity for coöperation in educational enterprise has been devised than is to be found in Operators Institutes sponsored by Trade Associations.

PAPERS AND DISCUSSIONS

NOTE ON "THE MEANING AND MICROSCOPIC MEASUREMENT OF AVERAGE PARTICLE SIZE"[1]

By E. P. Wightman[2]

Recently Perrott and Kinney have contributed an interesting article under the above title to the *Journal of the American Ceramic Society*. They state, very truly, that "the term 'average particle size' is capable of various mathematical interpretations many of which have little practical significance. The usual statistical method...considers only numbers of particles of a given size in determining the average diameter.... In practice it is difficult to dissociate a particle from its surface or volume." These authors take as the basis of measurement of particle size the "average diameter," and suggest that this be obtained, for ceramic materials, fillers, etc., from the formula

$$d_{av.} = \frac{y_s\, d}{100} = \frac{\Sigma\, nd^3}{\Sigma\, nd^2}$$

where y_s is the per cent of total surface represented by particles of diameter, d, and n is the relative number of particles of the same diameter. For coal or ore analysis they suggest the formula

$$d_{av.} = \frac{\Sigma\, y_v\, d}{100} = \frac{\Sigma\, nd^4}{\Sigma\, nd^3}$$

where y_v is the per cent of total volume of particles of diameter, d.

It seems to the writer that if one is to have a value which is of practical significance one should not choose always the average diameter, but average area, volume, or particularly in some case as a more accurately determinable value, the average *projective area* of the particles per unit of material.

In the above-mentioned materials this unit would be most likely the gram, but in photographic materials, for example, and perhaps even in the case of paints, it would be unit area of the plate surface, or surface to be covered. In the case of photographic materials where "average projective area" is used there is no uncertain third dimension, thickness, and the value is obtained practically from the relation

$$\bar{a} = \frac{\Sigma(y_a\, a)}{\Sigma\, y_a}$$

where y_a is the number of particles of each size (projective area), a, per unit (volume, area, mass, etc.) of the material, or of the surface on which

[1] *Jour. Amer. Ceram. Soc.*, 6 [2], 415 (1923).

[2] Received July 24, 1923.

it is coated. Rigidly of course this value should be obtained by integration, but where the class limits are not too large the error is negligible.

The writer, S. E. Sheppard and A. P. H. Trivelli,[1] have described a simple method of obtaining the size-frequency and size-area distribution of particles of a disperse material which they believe is less subject to error than that of either H. Green,[2] or of Perrot and Kinney.[3] Briefly, the disperse material is mounted on a microscopic slide by any suitable method, such that the ratio of amount of material per unit area of slide to the original unit is known. The grains are photomicrographed at a magnification commensurate with the sizes of the grains to be measured and the photomicrographs are further enlarged on a contrast paper, and the grains are then measured on the basis of a uniform projective-area scale by means of a rule calibrated in the limiting diameters corresponding to such uniform area classes, and the class sizes are read off directly. The average of the longest and shortest dimension, except where the grains are very irregular, gives a close approximation of the true mean class size. The very irregular grains can be measured either by a planimeter or by means of transparent cross-ruled paper. Wider or narrower class limits may be taken depending upon the accuracy desired. The writer in most of his work uses $0.2\mu^2$ as the class unit, but this is far too narrow for certain kinds of work.

In the case of ceramic materials a special rule could be made at a very small cost to read class-size directly in uniform volume increments, by having it calibrated in diameters corresponding to the class limits in volume assuming, of course, the volumes to be cubes or spheres. If the grains to be measured are thicker or thinner than this, a correction factor could be applied.

The same principle applies also to the case of any other material where volume or mass is more important than projective area.

Research Laboratory
Eastman Kodak Company
Rochester, N. Y.

DISCUSSION ON "NOTES ON THE DETERMINATION OF TRANSLUCENCY OF BODIES"[4]

Mr. Watts:—I should like to ask Mr. Parmelee whether they find it is possible to express the different values for different thicknesses in such a way that it can all be reduced to terms of unit thickness.

[1] *Jour. Phys. Chem.*, **27**, 1 (1923).
[2] *Jour. Franklin Inst.*, **192**, 638 (1921).
[3] *Loc. cit.*
[4] C. W. Parmelee and R. E. Lowrance, *Jour. Amer. Ceram. Soc.*, **6** [5], 630 (1923).

MR. PARMELEE:—That is our experience which is in accordance with Steger's recent report and also with Ashley's report.

MR. WATTS:—You are simply indicating the point on the test piece at which you make the test and then break it and measure it with a micrometer?

MR. PARMELEE:—We took the thicknesses at five different points, compared with a micrometer and calculated the average value for the thickness. We could have broken the pieces of course, but we did not do it.

MR. WATTS:—Were all these trial pieces jiggered?

MR. PARMELEE:—No. They were all cast.

MR. WATTS:—We already know that where the clay content differs you get a different density in the cast piece. Now, were you able to tie up in any way the apparent difference in density or have you any comparative data whereby we would be able to correct, if correction was necessary, for the difference in density? A correction was made for the specific gravity of the different slips, but I wondered if there was any evidence to show that difference in density of the cast body would really be a factor.

We have found so much of our data are apparently all right until somebody discovers that, "The difference in your ball clay content will give you different density and, therefore, your values are all off." I wondered whether these test pieces, as observed by you, are sufficiently uniform so that factor could be ignored. It seems to me we can ignore some of these points in making such determinations but if we are going to have a proposition which is absolutely precise and exact, it seems to me those things are of interest.

MR. PARMELEE:—The relative densities of the clays used and their influences upon the finished product were not considered in this experiment.

MR. WATTS:—They were all prepared under the same conditions?

MR. PARMELEE:—Yes.

MR. SPURRIER:—Are these glazed?

MR. PARMELEE:—No.

MR. SPURRIER:—Does the character of the surface influence the amount of light passing through? Suppose you have a very smooth polish. A good many years ago it was thought that surface radiations were disembodied. Pieces were covered with a certain varnish and results were very, very close in all cases, although there were no differences in surface, but it turned out that they really were determined by the covering of varnish.

MR. PARMELEE:—There is no doubt about the effect. The amount of the light transmitted depends on the character of the surface. We undertook to prepare the pieces as uniformly as possible.

ACTIVITIES OF THE SOCIETY

THE PRESIDENT'S PAGE

I wonder if the members realize to what extent the accomplishments, in fact the entire success of the SOCIETY depends on the activities of its Committees. This year, much like other years, the first six months have gone by with very little committee activity beyond sustaining interest in the projects already under way and as a result very little of new has been accomplished.

A few committees notably the Membership and Summer Meeting Committees and the Committee on Program and Papers have been busy and deserve the thanks of the officers and members.

Letters have been addressed to the Chairmen and members of the various committees outlining activities which during the next few months and years will lead to large accomplishments. After all it is accomplishment that is wanted; the activities are only means to accomplishments. The Chairmen must carry the responsibilities and it is to them that I appeal to use the next few months in such a way that the year will rank well above the average in things accomplished.

With the summer over the various Sections will again become active. The experiment tried by several Sections in the past year of holding joint meetings with other technical societies has been very successful and will be continued and extended.

The Membership Campaign is progressing steadily, but we need more workers. The SOCIETY has eighteen hundred personal members. If each one of those will ask, *merely ask*, one man to join within the next thirty days we shall have many new members. Try it, you who are interested enough in the SOCIETY to read the President's page.

It is not, primarily, that the SOCIETY shall have greater financial resources that new members are sought. It is that with more serving and being served the SOCIETY will have larger opportunities and its accomplishments made more effective.

NEW MEMBERS RECEIVED FROM AUG. 16 TO SEPT. 15

PERSONAL

Duncan M. Dayton, 190 Riverside Drive, New York, N. Y. (Vice President, N. Y. Vitreous Enamel Products Corp.)

J. C. DeKort, 26 Vermont St., Wheeling, W. Va. (Ceramic Printer, Warwick China Co.)

Charles E. Foose, c/o Wheeling Tile Co., Wheeling, W. Va.

Harry S. Haze, 404 S. Wells St., Chicago, Ill. (Merchandise Broker.)

Kenneth D. Joseph, 6370 Burchfield Ave., Squirrel Hill, Pittsburgh, Pa. (Sup't. of Sales, The O. Hommel Co.)

Erwin F. Lowry, Armstrong Cork Co., Lancaster, Pa. (Research Physicist.)

Joseph Lynch, 142 N. High St., Mount Vernon, N. Y. (Foreman Enamel Dep't. Ward Leonard Electric Company.)

Max Meth, Blackstone Bldg., Room 512, Pittsburgh, Pa. (Chemist.)

G. Verner Nightingale, 316 Bulletin Bldg., Philadelphia, Pa. (Sales Engineer, The Celite Products Co.)

John W. Patterson, Western Sheet Glass Co., Torrance, Calif. (Chief Engineer.)

L. E. Riddle, Jr., 67 Spring St., Metuchen, N. J. (Sales Manager, The Edgar Plastic Kaolin Co., and Edgar Bros. Co.)

John V. Rock, 366 W. Main St., Newark, Ohio.

Y. Sakamoto, c/o Research Laboratory, Asahi Glass Co., Kikuicho, Ushgome, Tokyo, Japan. (Chemist.)

Cyril C. A. Schwerha, P. O. Box 77, 5th & Monongahela Ave., Glassport, Pa. (Draftsman, Macbeth-Evans Glass Co.)

Arthur R. Stanbra, 26 Vermont St., Wheeling, W. Va. (Designer, Warwick China Co.)

John M. Tuthill, Philadelphia Porcelain Co., Woodlynne, Camden, N. J. (Vice-President and Secretary.)

John T. Wells, National Art Pottery Co., Coshocton, Ohio. (Secretary.)

CORPORATION

The DeVilbiss Mfg. Co., Toledo, Ohio. Frank A. Bailey. (Superintendent).

Penn Tile Works Co., Inc., Aspers, Pa. D. C. Asper. (President.)

Roberts and Mander Stove Co., Hatboro, Pa. Kenneth C. Farnsworth. (Gen'l Sup't.)

Active assistants to the Membership Committee are named in the following columns.

Name	Personal	Name	Personal	Corporation
J. C. De Kort	1	Frederick H. Rhead	1	
T. Raymond Edgar	1	Joseph P. Rodgers		1
Charles A. Facer	1	Charles L. Stamm	1	
Mabel C. Farren	1	Roy E. Swain	1	
Frederick G. Jackson	1	R. A. Weaver	1	
Harry F. Kahn	1	W. W. Wilkins	1	
R. D. Landrum	1	A. S. Zopfi		1
Carl F. Miller	1	Office	3	1
M. Namba	1		—	—
			17	3
		Less	3	0
			—	—
		Net gain	14	3

1923 NET MEMBERSHIP RECORDS

		Personal	Corporation	
January	12	1611	216	
March	14	1710	223	
April	14	1738	226	
May	14	1775	233	Total Roster Sept. 15 2099
June	14	1792	238	
July	14	1808	244	
August	14	1833	249	
September	14	1847	252	
Net Gain (1923)		236	36	
Same Period (1922)		251	60	

WHO'S WHERE IN THE AMERICAN CERAMIC SOCIETY

Erling E. Ayars, Chairman of the Refractories Division of this SOCIETY, is now living at 317 N. Eastern Ave., Joliet, Ill.

C. J. Crawford gives 2615 Singer Building, New York City as his business address. Mr. Crawford's home is still in St. Louis.

Charles A. Facer, formerly of Steubenville, Ohio, is now living at Wheeling, W. Va.

J. William Gayner, formerly of the Gayner Glass Works of Salem, N. J., is connected with the Lynchburg Glass Corporation at Lynchburg, Va.

Herbert Goodwin, recently of the Crescent China Company, Alliance, Ohio, has moved to Niles, Ohio, where he is working for the Atlas China Company.

John S. Halbert, Sales Engineer for the Hardinge Company, has moved to 7409 N. Ashland Blvd., Chicago, Ill.

Ives L. Harvey is President of the New Hope Brick Company at New Hope, Pa.

Mokiji Ichiji, who was reported in the list of "unknowns" in the September *Bulletin*, writes from Berlin that his future address will be c/o Nishikawa, 96 Eirakcho 1 chome, Keijo, Chosen, Japan.

Shigeba Kanashima, another Japanese member writes that his new address is Kamisakebe, Mitsugun, Okayama-ken, Japan.

Homer Knowles, who organized the Homer Knowles Pottery Company, is living at 747 Coe Ave., San Jose, Cal.

J. A. Martz has moved to New Brunswick, N. J., where he is teaching in the Department of Ceramics at Rutgers College.

D. M. McCann has left the Sterling Grinding Wheel Company of Tiffin, Ohio and is connected with the Michigan Porcelain Tile Works of Ionia, Mich.

Edward Milliken has moved from Columbus, Ohio to 1009 N. Water St., Uhrichsville, Ohio.

O. S. Mundy, formerly of Urbana, Ill., is now living at 316 Jackson St., Huntingburg, Ind.

S. O. Neiswanger gives Harvey, Iowa as his new address.

Elmer H. Ockerman of the Los Angeles Pressed Brick Company is living at 3731 S. Main St., Los Angeles, Calif.

R. S. Olsen of Champaign, Ill. has moved to Fox Lake, Ill.

T. Wilfred Owen has accepted a position as Ceramic Engineer with the Queen's Run Refractories Co., Inc., Lock Haven, Pa.

Amos Potts, Secretary of the Heavy Clay Products Division of the SOCIETY has moved from Columbus, Ohio to 118 E. Blaine St., Brazil, Ind.

W. H. Powell gives 350 Madison Ave., New York City as his new address.

A. Nugent Ragland, who was reported in the list of addresses unknown in the September *Bulletin*, is located with the Perth Amboy Tile Company, Perth Amboy, N. J.

Gregory L. Rogers is living at 7176 Hawthorn Ave., Hollywood, Calif.

Robert F. Sherwood has moved from Syracuse, N. Y. to Solvay, N. Y. where he is Ceramic Engineer with Pass and Seymour, Inc.

Charles A. Smith, B.S., graduate in ceramics of Ohio State University, June, 1923, has entered Lehigh University at Bethlehem, Pa., where he will continue his studies, doing post graduate work in metallurgy.

Paul Teetor has moved from McKinley Ave., to 911 Edgewood Ave., Trenton, N. J.

Thomas C. Walker, Jr., formerly of Columbus, Ohio, is now with the Los Angeles Pressed Brick Company, Los Angeles, Calif.

S. D. Yang is taking special work in cement making at the University of Michigan, Ann Arbor, Mich.

D. C. Wysor whose local address is Owensville, Mo., gives 40 Rector St., c/o General Chemical Company, New York City as his permanent address.

M. K. Zimmerman writes that he has moved from East Liverpool, Ohio to 1609 Ridge Ave., Steubenville, Ohio.

SYMPATHY AND GREETINGS TO JAPAN

The following note of sympathy from President Greaves-Walker has been mailed to each Japanese member of the AMERICAN CERAMIC SOCIETY.

"Mere words and figures will not bring to America a full realization of the awful calamity that has befallen the Japanese people. This is on account of the great distance we are away.

We wish you to know of the sympathy which is felt by all of us. We shall await with no little concern a report fully of your safety."

REPORT OF THE FALL MEETING

Another successful occasion is now a matter of record, that of the Fall Meeting of the AMERICAN CERAMIC SOCIETY. Many said that the following program was one of the most informing and inspiring they had ever heard. While the a la carte dinner was marred by the fact that adequate provision was made for only sixty of the eighty-six who attended yet this was a satisfactory meeting together of the members and their friends. The record of the Fall Meeting in New York City, September 19, 1923, in connection with the National Exposition of Chemical Industries is one of which the SOCIETY is justly proud.

The Program

A. PROMOTING FUEL ECONOMY IN KILN MANAGEMENT

(1) Report of Results in Coöperative Investigations by Refractories Manufacturers' Association and U. S. Bureau of Mines.
By Frederick W. Donahoe, Secretary, Ref. Mfg. Assn.

(2) Possible Economies in Kiln Firings.
By George A. Bole, U. S. Bureau of Mines.

B. INDUSTRIAL ART

(1) The Industrial Art Movement, Its Possibilities in Ceramic Industries.
By Richard F. Bach, Curator Industrial Arts, Metropolitan Museum.

(2) Method of Color Measurement, An Industrial Need.
By A. E. O. Munsell, Munsell Color Co.

(3) A Scientific Color Analysis.
By H. S. Busby.

C. FEDERAL COÖPERATIVE MOVEMENTS

(1) Investigations by and Purposes of the Federal Specifications Board in Reference to Ceramic Products.
By R. F. Geller, U. S. Bureau of Standards.

(2) The American Construction Council, Its Aims and Methods.
By D. Knickerbocker Boyd, Vice-President.

D. Refractories

(1) The Properties of Some Commercial Refractories.
By R. M. Howe, Kier Fire Brick Co.

(2) The Manufacture of Refractories.
By W. F. Rochow, Harbison-Walker Refractories Co.

The Attendance

Allan, Reginald, Newark, N. J.
Allen, F. B., Woodbridge, N. J.
Applegate, D. H., New York, N. Y.
Armstrong, C. H., East Liverpool, Ohio
Baldwin, H. C.
Barth, Victor, Great Barrington, Mass.
Barlow, R. S., New York, N. Y.
Bernier, A., Montreal, Que.
Bernhard, E. J., New York, N. Y.
Bloomfield, Chas. A., Metuchen, N. J.
Bloomfield, Howard W., Metuchen, N. J.
Bole, Geo. A., Columbus, Ohio.
Booze, M. C., Pittsburgh, Pa.
Brenner, R. F., Parkersburg, W. Va.
Brown, Leslie, Trenton, N. J.
Brown, H. E., Palmerton, N. J.
Brown, G. H., New Brunswick, N. J.
Bruswaiger, H. P., New York, N. Y.
Burroughs, F. H., Trenton, N. J.
Busby, H. S., New York, N. Y.
Butler, W. W., Cleveland, Ohio.
Byers, L. L., Philadelphia, Pa.
Campbell, A. R., Metuchen, N. J.
Carter, J. D., Philadelphia, Pa.
Carrier, A. D., Mechanicsville, N. Y.
Caven, F. M., New York, N. Y.
Chaffin, E. G., Worcester, Mass.
Clare, R. L., Perth Amboy, N. J.
Clark, W. M., Cleveland, Ohio.
Clarke, J. H., Wilmington, Mass.
Crane, C. W., Elizabeth, N. J.
Crawford, C. J., St. Louis, Mo.
Crofoot, A. B., Plainfield, N. J.
Cushman, H. D., Cleveland, Ohio.
Daley, J. F., Astoria, N. Y.
Dierauf, E., Hackensack, N. J.
Dinsmore, F. W., Trenton, N. J.
Dorsey, F. M., Cleveland, Ohio.
Dougherty, L. A., Long Island City, N. Y.
Easter, G. J., Niagara Falls, N. Y.
Edgar, D. R., Metuchen, N. J.
Edgar, I. R., Metuchen, N. J.
Egan, F. W., New York, N. Y.
Eldridge, C. H., Metuchen, N. J.
Finn, A. N., Washington, D. C.
Forse, E. B., Perth Amboy, N. J.
Franzheim, C. M., Wheeling, W. Va.
Geiger, Chas. F., Perth Amboy, N. J.
Geller, R. F., Washington, D. C.
Gesner, M. A., New York, N. Y.
Geyer, L. E., Columbus, Ohio.
Gibson, D. B., Chicago, Ill.
Gibson, Thos. W., Toronto, Ont.
Goetschins, H. B., Roscoe, N. Y.
Goheen, J. P., Philadelphia, Pa.
Greenwood, W. W., Worcester, Mass.
Gregory, M. C., Corning, N. Y.
Hagar, Donald, Matawan, N. J.
Hagar, I. D., New York, N. Y.
Handy, Jas. O., Pittsburgh, Pa.
Hanna, R. E., Perth Amboy, N. J.
Harrison, H. C., Columbus, Ohio.
Hassinger, C. C., Plymouth Meeting, Pa.
Hastings, F. H., Hartford, Conn.
Henry, A. V., Columbus, Ohio.
Hill, E. C., Philadelphia, Pa.
Hill, C. W., Perth Amboy, N. J.
Horning, Roy A., Lancaster, Pa.
Hostetter, J. C., Corning, N. Y.
Hottinger, A. F., Chicago, Ill.
Howat, W. T., Perth Amboy, N. J.
Howe, R. M., Pittsburgh, Pa.
Hunting, E. C., Alfred, N. Y.
Husch, W. C., Chicago, Ill.
Ingram, Charles, New York, N. Y.
Jones, Chester H., Chicago, Ill.
Keller, G. W., Philadelphia, Pa.
Kester, W. B., Spruce Pine, N. C.
Kingsbury, P. C., Keasby, N. J.
Klein, A. A., Worcester, Mass.
Krak, J. B., New York, N. Y.
Ladoo, R. B., Cleveland, Tenn.
Landrum, R. D., Cleveland, Ohio.
Larson, E., New York, N. Y.
Logan, L., Pittsburgh, Pa.
Low, Thos. M., Cleveland, Ohio.
McCaughey, W. J., Columbus, Ohio.
McFarland, L. W., New York, N. Y.

McKeown, T. H., New York, N. Y.
McNeill, W. K., Toronto, Ont.
Mahnken, H. J., Elizabeth, N. J.
Mallory, J. M., Savannah, Ga.
Malsch, W., New York, N. Y.
Martz, J. A., New Brunswick, N. J.
Mathiasen, Alfred, Matawan, N. J.
Mathiasen, O. E., Perth Amboy, N. J.
Minton, R. H., Metuchen, N. J.
Moore, Jos. K., New York, N. Y.
Muessig, C. N., New York, N. Y.
Munn, James, Cleveland, Ohio.
Munsell, A. E., Baltimore, Md.
Navias, Louis, Washington, D. C.
Newcomb, R. N.
Nightingale, G. V., Philadelphia, Pa.
O'Brien, T. H., Providence, R. I.
Ogden, E. P., Philadelphia, Pa.
Patch, Clifford, Bangor, Maine.
Penfield, L. W., Willoughby, Ohio.
Pettit, Ralph E., Chicago, Ill.
Pigott, H. W., Philadelphia, Pa.
Pratt, J. H., Chapel Hill, N. C.
Purdy, Ross, C., Gen. Secy. Amer. Ceram. Soc.
Putnam, L. E., New York, N. Y.
Ragland, N. A., Perth Amboy, N. J.
Rhead, F. H., Zanesville, Ohio.
Rhead, Lois W., Zanesville, Ohio.
Richardson, P. B., Boston, Mass.
Riddle, L. E., Jr., Metuchen, N. J.
Robinson, C. J., Canandaigua, N. Y.
Rochow, W. F., Pittsburgh, Pa.
Rose, R. P., New York, N. Y.
Runge, F. W., Rochester, N. Y.
Saxe, Chas. W., Worcester, Mass.
Schmolze, P. E., New York, N. Y.
Scott, W. J., Washington, D. C.
Seasholtz, J. M., Reading, Pa.
Shaw, J. B., Alfred, N. Y.
Shaw, L. I., Washington, D. C.
Shearer, W. L., Washington, D. C.
Shegog, T. A., Sebring, Ohio.
Sheppard, Mark, Norristown, Pa.
Simcoe, Geo., Metuchen, N. J.
Slack, Robt. M., New York, N. Y.
Smith, C. A., Bethlehem, Pa.
Smith, P. A., New Brighton, Pa.
Smith, R. G., Chicago, Ill.
Smith, Norman G., Brunswick, Me.
Solomon, M., New Haven, Conn.
Sortwell, H. H., Trenton, N. J.
Sperr, F. W., Jr., Pittsburgh, Pa.
Sproat, Ira A., New York, N. Y.
Staley, H. F., New York, N. Y.
Stamm, C. L., Mount Vernon, N. Y.
Staudt, August, Perth Amboy, N. J.
Stanger, Frederick, Philadelphia, Pa.
Steinhoff, F., Chicago, Ill.
Stephani, W. J., Crum Lynne, Pa.
Stephenson, H. H., Montreal, Can.
Stephenson, L. L., Birmingham, Ala.
Stone, C. H., Jr., Rome, Ga.
Stull, R. T., Savannah, Ga.
Swan, S. D., New York, N. Y.
Tailby, R. V., Matawan, N. J
Tucker, G. M., Long Island City, N. Y.
Turner, Eric W., Trenton, N. J.
Underwood, C. A., Boston, Mass.
Watkins, Joel H., Charlotte, C. H., Va.
Weber, K. B., Astoria, L. I.
Weigel, W. M., Washington, D. C.
Whitaker, F. A., Keasby, N. J.
White, A. T., Dover, N. J.
Wikoff, A. G., New York, N. Y.
Will, Otto W., Metuchen, N. J.
Williams, J. L., Metuchen, N. J.
Young, G. A., Bloomfield, N. J.

NOTES AND NEWS

THE REFRACTORIES OPERATIVE INSTITUTE

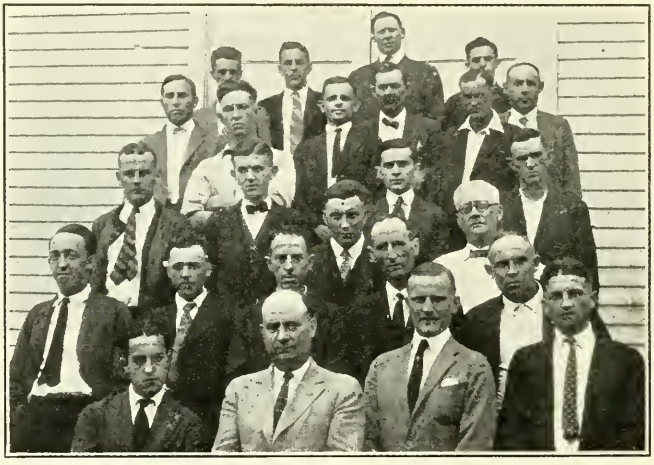
By Frederic W. Donahoe[1]

Some six years ago, in an annual meeting of The Refractories Manufacturers Association, Mr. Richard D. Hatton, of St. Louis, then president of the Association, urged the adoption of a functionalized group plan, whereby the best practice existing in the manufacture, administration and accounting methods and in the sale of refractories would be established through the development of so-called institutes, in which those directly in charge of the various departments would be the active members and officers.

[1] Secretary, The Refractories Manufacturers Association.

The seed thus sown took root, but no signs of growth were apparent for about three years. In 1920, the Association voted to establish an Institute in which the men and women employed in the accounting departments of the members of the Association could be brought together, given an appropriation and left, as it were, to demonstrate the wisdom of a semi-independent organization. The success of the Refractories Accountants Institute led to the next step, which was taken during the latter part of 1922, when a committee was appointed to organize a Refractories Operatives Institute in which key-men, actively engaged in the various processes of manufacture at the plants of the members of the Association, would be brought together and led to the discussion of problems common to them all.

At the outset it was thought that the Refractories Operatives Institute should be national in scope and include operating men from coast to coast. The organization



Kentucky-Southern Ohio District Refractories Manufacturers Association, Operators Institute Meeting, Hayward, Ky., Aug. 17, 1923.

committee, however, decided that this would limit the number of meetings to one (or perhaps two) a year and as a consequence a policy was adopted which opened the way for the establishment of branches in every clay fire brick producing district in the country. When these branches are all functioning, the project of a national meeting will be given due consideration.

The first branch was started in the Southern Ohio-Kentucky field at a meeting held at Ironton, Ohio, on January 23, 1923. Shortly after that, a branch was started in Pennsylvania, a meeting being held at Pittsburgh on February 14. A third branch got off to a flying start on August 23, at New York, those in attendance being operating men employed by refractories manufacturers owning plants in New York, New Jersey and New England.

Southern Ohio-Kentucky Branch

Thirty-one operating men connected with fifteen companies owning plants in the Southern Ohio-Kentucky field constitute the membership. They have held seven meetings and plan to hold one each month from now on. The average attendance so far,

has been twenty-one. Papers have been read and discussions had on the following subjects:

Modern Methods of Insulating Periodic Kilns
Machine Made Fire Brick with Special Reference to Steam Lubrication
Drying—on Hot Floors, in Tunnel Dryers and in Kilns
Setting Kilns—with Special Reference to Differentiation between Hand Made and Machine Made Brick
Heat Losses in the Burning of Clay Fire Brick
Suggestions on the Fine Points of Molding
The Disposition of Water Smoke in the Initial Stages of Burning

In addition to the formal papers above listed, informal talks have been given on a wide range of subjects, many of which have covered personal experiences in overcoming manufacturing difficulties that are more or less common to all fire brick plants.

Pennsylvania-Maryland-West Virginia Branch

Despite the fact that the plants in this district outnumber those in Southern Ohio-Kentucky by more than three to one, the membership of the Pennsylvania-Maryland-West Virginia Branch of the Refractories Operatives Institute is smaller and much less active. Twenty-three members have held four meetings in all, with an average attendance of fifteen.

The work done has been more in the nature of general discussions on questions selected by a "steering committee" than the following of formal papers. Among the questions that have been taken up and either disposed of or carried over for reports to be later made by committees appointed for that purpose, are:

Should the time of grinding be left to the judgment of the pan-tender or should there be a definite time limit set?
Should the amount of water used in the mix be left to the judgment of the pan-tender or should the water be accurately measured? What are the best measuring devices for this purpose?
What is the relative importance of the different piece-workers in the manufacture of fire brick? Are the piece-workers of the same relative importance giving approximately the same amount of labor to accomplish a day's work?
Is the refractories industry training a sufficient number of young men as molders and pressers to maintain the present rate of output on hand-made brick and shapes?
What is the most economical wood to use for molds?
What are the causes for the existing variation in the size of 9-inch straight brick?

Formal papers have been presented and discussed on the following subjects:

Control and Reduction of Floor Breakage
Compensation Insurance
Benefits of Grog (calcined clay) in Mixes
Daily Labor Cost Reports.

New York, New Jersey and New England Branch

This branch has fourteen members and has held but one meeting, at which six members were present. Its present purpose is to hold four meetings a year.

Branches are being organized in Missouri and in Colorado. As in the case of the branches now functioning, the first meeting will be attended by one of the members of the Association's committee, which consists of Mr. E. M. Weinfurtner, of Ashland, Ky., Mr. George H. Diack, of Lock Haven, Pa. and Mr. Samuel M. Kier, of Salina, Pa. Each branch has its own Constitution and By-Laws, elects its own officers and is self-supporting.

OHIO STATE FELLOWSHIPS NAMED

The three fellowships made available at the Ohio State University in coöperation with the U. S. Bureau of Mines have been filled. The following men together with the investigation to be undertaken have been chosen by the committee in charge.

A. J. Andrews—The fabrication of dolomite refractories.

J. G. Phillips—Volume changes occurring in fire clay refractories during the burning.

F. T. Heath—Subject to be chosen.

Each of these men is a candidate for his doctorate. Messrs. Phillips and Heath in Ceramics and Mr. Andrews in Chemistry. The work is being carried out in the laboratories of the Bureau and under the co-direction of the Superintendent of the Bureau and the head of the Department in which the incumbent is a candidate for a degree.

FRANK H. RIDDLE IN EUROPE

Frank H. Riddle, former president of the American Ceramic Society (1922–23) will sail for France on the "S. S. Leviathan," in November. Mr. Riddle will present a paper before the International Conference on Insulators which will be held in Paris on November 26. The subject of the paper will be "Relation between the Composition, Micro-Structure and the Physical Properties of Porcelain."

The trip will be made in the interests of the Champion Porcelain Company and the Jeffery-Dewitt Insulator Company and while in France he will do some advisory work for the Compagnie General D'Electric Ceramique, one of the largest ceramic manufacturers in France.

This firm recently completed a modern plant equipped with tunnel kilns to manufacture special thick insulators under Jeffery-Dewitt patents.

Mr. Riddle will also visit other plants, not only in France but in other European countries.

On September 13, Mr. Riddle gave a talk in Cincinnati on the manufacture of electrical porcelain for high tension insulators at a meeting of the local section of the American Institute of Electrical Engineers.

RESEARCH ON DRY PRESSING OF AMERICAN TALC

The American Lava Corporation of Chattanooga, Tenn., has entered into a coöperative agreement with the department of the Interior, U. S. Bureau of Mines, whereby a study of dry pressing of American tales will be made. Under the terms of the agreement the Bureau will study methods of proper beneficiation of the talc as well as fabrication of the ware.

R. M. King is employed directly in the laboratory and field work, which is under the director of the Columbus Station of the Bureau.

ELLSWORTH OGDEN LEAVES BUREAU OF MINES

Ellsworth Ogden has severed his connection with the Columbus Station of the U. S. Bureau of Mines as Ceramic Engineer to go with the Lavino Refractories Company of Philadelphia, Pa. Mr. Ogden, while with the Bureau, was connected with the survey of burning conditions on refractory plants and will serve the Lavino Company in a similar capacity.

This is another of the oft repeated cases where the industry avails itself of the excellently trained men who have received experience along a special line in the government service.

INTERNATIONAL CRITICAL TABLES OF NUMERICAL DATA ON PHYSICS, CHEMISTRY AND TECHNOLOGY

Prepared under the Auspices of the International Research Council

The Board of Editors of *International Critical Tables* met in Washington, D. C., August 16 for three days to select coöperating experts who will be invited to assume responsibility for critically compiling the various classes of data. It is estimated that four hundred coöperating experts will be needed. Selection will be made largely on the basis of recommendations received from the corresponding editors and their Advisory Committees from the principal countries of the world.

Invitations to act as coöperating experts will be issued from the editorial office as fast as action is taken by the Board. From responses thus far received a full measure of coöperation is expected from the chemists and physicists of the world.

In dividing the subject matter for assignments the Board has endeavored to make each of such a magnitude that it can be reasonably completed in a year's time without proving too great a burden upon any expert.

International Annual Tables is now in its 12th year. It has demonstrated the possibility of preparing through international coöperation an annual abstract of the results of the world's researches in quantitative measurement. The purpose of *International Critical Tables* is to take an account of stock of our present quantitative knowledge of material things and to publish in convenient form the result of expert criticism of this knowledge.

The International Union of Pure and Applied Chemistry and the International Research Council have given the weight of their authority and influence to *International Critical Tables*. American industries will supply the necessary funds. It remains only for the scientists of the world to contribute their time, money and expert knowledge to insure the successful completion of the undertaking. Science itself is international.

If the results of scientific research are to be utilized most efficiently they must first be made easily accessible. To make these results accessible so that they may be utilized to the best advantage is as much the duty of men of science as are the researches which produce them and the task of rendering these results readily accessible requires the coöperation of the same types of expert knowledge as have been employed in producing them.

Organization of International Critical Tables

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THE BUREAU OF STANDARDS WANTS COÖPERATION

Tests Applied to Drying Properties of Clay

By G. K. Burgess[1]

The Bureau of Standards has developed a series of tests applied to the drying properties of clays. In order to have this work include a wide range of materials and to become of general practical use manufacturers are urged to submit for test clays in use at their plants. It will be desirable to receive a variety of clays, those which have the best drying characteristics as well as those which offer difficulty in drying.

Clays submitted should be accompanied by the following information:

1. Kind.
   (*a*) Surface clay
   (*b*) Shale
   (*c*) No. 1 or No. 2 fire clay.
2. Articles manufactured.
   (*a*) Hollow tile
   (*b*) Sewer pipe
   (*c*) Brick (paving or building).
3. Drying treatment in plant.
   (*a*) Type of drier
   (*b*) Time required to dry
   (*c*) Temperatures in drier (if tunnel drier at hot end).
4. Difficulties experienced.
   Extent of loss of ware.

The tests to which the clays will be subjected will include the following:

1. Average water of plasticity.
2. Drying shrinkage at 110°C.
3. Safe and ideal rate of drying stated either in per cent of moisture loss per hour or, if the weight relative to the exposed area of the manufactured pieces be given, the time can be stated in hours, with the proper temperature, humidity and air circulation to be maintained.
4. Rate of drying shrinkage compared to loss in moisture and the stage of drying at which shrinkage is complete.
5. Strength of the unfired piece.
6. If desirable, dry porosity and the moisture diffusion constant can be given; however, these factors are related and applied in the drying rate under No. 3.

It is expected, from this work, that it will be possible to recommend improvements in drying treatment and to overcome difficulties now current in the handling of many materials. It will also be possible to give data on new materials, predicting their drying behavior in commercial driers.

The manufacturers can aid largely in this work by immediately submitting samples of their raw material together with full details of character and treatment, as previously outlined.

PACIFIC NORTHWEST CLAYWORKERS' ASSOCIATION

The summer meeting of the Pacific Northwest Clayworkers' Association[2] was held at the Northern Clay Company, Auburn, Washington Saturday afternoon and evening, August 25th. The program covered a series of papers on Driers and Drying Clay Products, as follows:

[1] Director, Bureau of Standards.

[2] Hewitt Wilson, Secretary.

1. Clay and Water—Marriage and Divorce. Hewitt Wilson, Ceramic Department, University of Washington, Seattle.
2. Commercial Drying Methods and Dryers for Clay Wares. W. E. Lemley, General Superintendent, Denny Renton Clay and Coal Co., Seattle.
3. The Martin Steam Pipe Rack Brick Drier and the Boss Drying System. Samuel Geijsbeek, Geijsbeek Engineering Company, Seattle.
4. The New Double Deck Brick Drier at the Builder's Brick Company. F. T. Houlahan, Seattle.
5. The Carrier Humidity Drier for Terra Cotta. Demonstration. Paul S. MacMichael and A. Lee Bennett, Northern Clay Company.
6. Heat Losses and Control or Where Your Money Goes. Hewitt Wilson.
7. The Manufacture of Refractories. The new film of the U. S. Bureau of Mines was shown at one of the local moving picture houses.

Over forty men from Oregon and Washington attended the meeting and were treated to a magnificent dinner at one of the Auburn restaurants at the expense of the Northern Clay Company.

This is the third meeting of the Association this year. In fact the Association was only organized January 20th, 1923 and already there is a membership of over fifty.

At the next meeting, tentative date January 20, 1924, the question of Kilns and Methods of Firing will be discussed.

SUMMARIZED REPORT OF HOTEL CHINAWARE CONFERENCE

At the request of a joint committee of the American Hotel Association and the American Vitrified China Manufacturers Association, the Department of Commerce arranged a general conference of hotel men, potters, government representatives and others interested, on May 28, 1923, at Washington, D. C., to consider constructive eliminations of excess sizes and varieties of hotel chinaware. Interest in applying Simplified Practice to this commodity originated in an address by Mr. A. Lincoln Scott, representing the Research Bureau of the American Hotel Association, before the annual convention of the American Ceramic Society at Pittsburgh.

Following Mr. Scott's presentation, the Society endorsed a program for Simplification and asked a committee from the Research Bureau of the Hotel Association to meet with the American Vitrified China Manufacturers Association at the Hotel Astor, New York, April 10, 1923. Here Mr. Scott especially emphasized the simplification of chinaware from the hotel standpoint and the manufacturers adopted a resolution authorizing the appointment of a committee to work with a similar group from the Hotel Association, and further authorized the appointment of an industrial engineer to coöperate with an engineer from the Hotel Association Research Bureau.

On May 7, a joint meeting of these committees was held at the Hotel McAlpin, New York, where Mr. A. E. Foote, of the Division of Simplified Practice, presented the available service of the Department of Commerce and illustrated with lantern slides accomplishment in many similar lines. From this last meeting was developed the General Conference of May 28, with personnel as detailed in the accompanying list. Some 700 samples of hotel chinaware, representatives of 200 variations commonly merchandized were before the meeting, and after thorough discussion the conference crystallized its unanimous opinion in the following resolutions and the recommendation now issued in tentative form as Simplified Practice Recommendation No. 5 of the Department of Commerce:

WHEREAS the Vitrified China Manufacturers' Association in coöperation with the American Hotel Association and other interested representatives have met with and at the invitation of the Secretary of Commerce and the chief of the Division of Simplified Practice for the purpose of considering the simplification of hotel chinaware in the interests of economy, be it

Resolved that as a step towards the elimination of excess varieties of hotel chinaware, the Vitrified China Manufacturers' Association, in coöperation with the American Hotel Association, hereby recommends the establishment of the sizes and varieties as standard for hotel use, as shown on the attached list:

Furthermore, be it *Resolved* that the Vitrified China Manufacturers' Association and the American Hotel Association hereby commend the constructive coöperation of the Division of Simplified Practice of the Department of Commerce, in lending its assistance to our effort to eliminate waste through the reduction of variety in hotel chinaware, and likewise commend the Chamber of Commerce of the United States for the helpful service rendered in this connection.

TABLE I

SIMPLIFIED PRACTICE RECOMMENDATION NO. 5
HOTEL CHINAWARE

In accordance with the unanimous action of the joint conference of all interests concerned with Hotel Chinaware, personnel as shown in the accompanying list, the U. S. Department of Commerce recommends that the recognized sizes and varieties of this commodity be restricted to the following:

Roll edge list	Trade size	Actual size	Tolerance
Plates	4″	6 1/4″	1/8″
Plates	5″	7 1/8″	1/8″
Plates	6″	8 1/8″	1/8″
Plates	7″	9″	1/8″
Plates	8″	9 5/8″	1/8″
Plates, Rim Soup	5″	7″	1/8″
Plates, Rim Soup	7″	9″	1/8″
Plates, Coupe, Soup	6″	7 1/2″	1/8″
Plates, Individual butter	2 1/2″	3 1/2″	1/8″
Dishes, oval, platters	4″	7″	1/8″
Dishes, oval, platters	6″	9 1/8″	1/8″
Dishes, oval, platters	8″	11 1/4″	1/4″
Dishes, oval, platters	10″	13 1/4″	1/4″
Dishes, oval, platters	12″	15 1/8″	1/4″
Bakers, vegetable dishes	2 1/2″	5 1/4″	1/8″
Bakers, vegetable dishes	3″	5 3/4″	1/8″
Bakers, vegetable dishes	5″	7 1/4″	1/8″
Bakers, vegetable dishes	8″	10″	1/8″
Boats (sauce)	Large	11 oz.	1/4 oz.
Boats (sauce)	Medium	5 oz.	1/8 oz.
Boats (sauce)	Small	3 oz.	1/8 oz.
Bowls, Ftd	30's	5 3/4 oz.	1/8 oz.
Bowls, Sugar	No. 2	12 oz.	1/2 oz.
Bowl, salad	No. 1	11 1/8″	1/8″
Bowl, salad	No. 3	9 1/2″	1/8″
Bowl, salad	No. 4	8 1/4″	1/8″

Bowl, salad	No. 5	7″	1/8″
Bowl, salad	No. 6	6 1/8″	1/8″
Cups, Bouillon, Huber	....	7 1/2 oz.	1/8 oz.
Cups, Bouillon, Boston	2 B H	7 1/2 oz.	1/8 oz.
Cups, Coffee, Huber	....	9 1/2 to 10 ozs.	...
Cups, Tea, Huber	....	7 to 8 ozs.	...
Cups, Tea, Boston	....	7 1/2 oz.	1/4 oz.
Cups, Extra Tea, Boston	....	8 1/2 to 9 ozs.	...
Cups, Egg, Wheat, Unhd	....	6 1/2 oz.	1/2 oz.
Cups, Coffee, Saxon A. D.	....	3 5/8 oz.	1/8 oz.
Saucers, Coffee, A. D. (To match cups)	....	4 7/8 oz.	1/8 oz.
Cake Cover	....	6 1/4″	1/8″
Celery Tray, oval	No. 1	12″	1/8″
Celery Tray, oval	No. 22	10″	1/8″
Celery Tray, oval	No. 3	7 5/8″	1/8″
Celery Tray, oval	Fancy	11″	1/8″
Creams, No. 1 Tankard Hd or Unhd	....	1 3/4 oz.	1/4 oz.
Dishes, Fruits, coupe shape	3″	4 1/8″	1/8″
Dishes, Fruits, coupe shape	3 1/2″	4 3/4″	1/8″
Dishes, Fruits, coupe shape	4″	5 3/8″	1/8″
Dishes, Fruits, coupe shape	4 1/2″	5 3/4″	1/8″
Dishes, Ice cream	4″	4 1/8″	1/8″
Dishes, Grape Fruit	....	6″	1/8″
Dishes, Pickle, oval	....	8 3/4″	1/8″
Jugs	6's	5 1/2 to 6 3/4 pts.	...
Jugs	12's	3 1/2 to 5 pts.	...
Jugs	24's	3 to 3 1/2 pts.	...
Jugs	36's	1 to 1 1/4 pts.	...
Jugs	42's	3/4 pts.	...
Jugs	48's	5 to 6 ozs.	...
Jugs, Hall Boy Pitcher	24's	2 3/4 pts.	1/2 pts.
Mustard Pots, Vienna Unhd	No. 1	4 1/2 oz.	1/2 oz.
Nappies	3″	5″	1/8″
Nappies	4″	5 3/4″	1/8″

For government service the above list of shapes are required plus the additional shapes listed below

Jug Pitcher	5's	8 pts.	1/2 pt.
Jug Cream	54's	4 1/2 oz.	1/2 oz.
Sugar Bowl, individual	....	5 oz.	1/4 oz.
Egg Cup, double	....	4 oz.	1/8 oz.
Sugar Bowl	No. 1	17 oz.	1 oz.
Coffee Pot, individual	....	12 oz.	1 oz.
Pin tray	....	5 1/4″	1/8″
Casserole, plain	8″	2 3/4 to 3 pts.	...
Match stand round hooded	....	6 1/2″	1/2″
Ice Tub	....	9 1/4 pts.	3/4 pt.

It is further recommended that the recognized items be made in three weights only, as covered by the trade names "ROLLED EDGE," "MEDIUM WEIGHT" and "LIGHT WEIGHT," respectively.

Approved subject to regular annual review in conference with the Central Committee of the Industry.

HERBERT HOOVER
Secretary of Commerce

July 1, 1923

Personnel of Chinaware Conference

POTTERS' REPRESENTATIVES

Bown, Lew H., Buffalo Pottery, Buffalo, N. Y.
Goulding, A. L., Warwick China Co., Wheeling, W. Va.
Huber, Wm. L., Onondaga Pottery Co., Syracuse, N. Y.
Mayer, Arthur E., The Mayer China Co., Beaver Falls, Pa.
Purdy, Ross C., American Ceramic Society, Lord Hall, O. S. U., Columbus, O.
Read, Charles W., Shenango Pottery Co., New Castle, Pa.
Sutterlin, Frederick, Maddock Pottery Co., Trenton, N. J.

HOTEL REPRESENTATIVES

Dyer, Herbert A., Hotel Biltmore, New York City—Amer. Hotel Assn.
Gillis, Geo. M., 1410 M St., The New Willard, Washington, D. C.
Hight, Frank S., The New Willard, Washington, D. C.
Scott, A. L., American Hotel Association, Chicago, Ill.
Scofield, Franklin D., American Hotel Association, Hotels McAlpin and Martinique, New York City.

FEDERAL REPRESENTATIVES AND MISCELLANEOUS DISTRIBUTORS

Bates, P. H., Bureau of Standards, Washington, D. C.
Bentley, U. S. A., Captain Geo. A., Room 2214 Munitions Bldg., War Department, Washington, D. C.
Brown, F. C., Bureau of Standards, Washington, D. C.
Edwards, Lt. Comdr. E. C., Room 1105 Navy Bldg., Washington, D. C.
Harrison, A. J., U. S. Veterans Bureau, Rm. 736, Arlington Bldg., Washington, D. C.
Hazelwood, F., Bureau of Standards, Washington, D. C.
Holden, P. E., Fabricated Production Dept., C. of C. of U. S., Washington, D. C.
Kidd, R. C., Federal Specifications Board, U. S. Veterans Bureau, Washington, D. C.
Kinsey, R. D., U. S. Public Health Service, 1211 13th St. N. W., Washington, D. C.
Puryear, Major B., Jr., U. S. Marine Corps, Navy Bldg., Washington, D. C.
Sortwell, H. H., Trenton, N. J.
Williams, Arthur E., Bureau of Standards, Washington, D. C., Chairman, Federal Specifications Board.

DIVISION OF SIMPLIFIED PRACTICE

Foote, A. E., Division of Simplified Practice, Department of Commerce, Washington, D. C.
Gately, Wm. A., Department of Commerce, Washington, D. C.

PROF. PARMELEE RECEIVES APPOINTMENT

Professor C. W. Parmelee has been made Head of the Department of Ceramic Engineering at the University of Illinois. He has been connected with the institution since 1916 as Professor of Ceramic Engineering and during the past year served as Acting Head.

CALENDAR OF CONVENTIONS

Organization	Date	Place
AMERICAN CERAMIC SOCIETY (Annual Meeting)	Feb. 4–8, 1924	Atlantic City
American Concrete Institute	Feb. 25–28, 1924	Chicago
American Face Brick Assn.	Dec. 4–6, 1923	French Lick Springs, Ind.
American Face Brick Assn. (Southern Group)	Nov. 1923	West Baden, Ind.
American Malleable Castings Assn.	Jan. 1924	Cleveland, Ohio (?)
American Road Builders' Assn.	Jan. 14–18, 1924	Chicago
American Trade Assn. Executives	Oct. 24–26, 1923	Chicago
American Zinc Institute	May, 1924	St. Louis
Assn. of Scientific Apparatus Makers of U. S. A.	April 18, 1924	Washington, D. C.
Common Brick Mfrs. Assn. of America	Feb. 11, 1924	Los Angeles, Calif.
Gas Products Assn.	Jan. 1924	Chicago
Hollow Bldg. Tile Assn.	Jan. 1924	Chicago (?)
Natl. Assn. of Stove Mfrs.	May 7–8, 1924	New York, Hotel Astor
Natl. Brick Mfrs. Assn.	Feb. or Mar. 1924	
Natl. Builders Supply Assn., Inc.	Feb., 1924	Chicago (?)
Natl. Electric Light Assn.	May or June, 1924	
Natl. Glass Distributors Assn.	Dec. 4–5, 1923	Pittsburgh, Pa.
Natl. Paving Brick Mfrs. Assn.	Dec., 1923	
Portland Cement Assn.	Nov. 19–21, 1923	New York
Stoker Mfrs. Assn.	Oct. 25, 1923 (?)	
U. S. Potters Assn.	Dec., 1923	Washington, D. C.(?)

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of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

F. H. Rhead, H. S. Kirk — Art
H. F. Staley, R. R. Danielson — Enamel
A. R Payne, A. E. Williams — Glass
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Bureau of Standards, Washington, D. C.

Vol. 2 November, 1923 No. 11

EDITORIAL

INDEBTEDNESS

An honest and honorable person abhors indebtedness unless there is profit to be gained in its assumption and payment. Each person owes to self and to others certain obligations which, if not acknowledged and discharged, become abhorent.

No service is rendered for which a compensation of some sort is not due. Those who receive service, whether wittingly or otherwise are obligated to pay the compensation which that service has made due. The welfare of man in all particulars is dependent on the extent and promptness with which these obligations are recognized and discharged.

How about indebtedness to one's fellow men and to society in general? Is a person obligated to his city, state and nation; to his posterity? To the point of this editorial—has a person an obligation to his profession or to his industrial fellow that is not a basic obligation to self?

Each person in a community profits from a strong, virile and progressive government, school and church. The K. of C., the Y. M. C. A., and the many social, religious, and educational institutions have made living more pleasant and profitable to each and every person. It is profitable alike to the childless and to the parent that good schools are maintained. It is beneficial to each person that no money or effort be spared to keep well

and alive every human being. For all of these benefits each person is obligated to pay his quota in support of the means employed.

How about one's interests and obligations in the welfare of his industrial fellows? Does it profit a person who is engaged in ceramic work to maintain strong and virile educational institutions devoted exclusively to the ceramic arts and sciences?

Those who are informed of the facts know that the ceramic industries as a whole and that each firm or corporation separately have profited and continues to profit a great deal from the researches reported through the AMERICAN CERAMIC SOCIETY and from the gathering together in its conventions for the purpose of discussing technical plant problems. This SOCIETY is an organized corporation and a membership implies an obligation to coöperate for mutual profit, but this obligation rests with all ceramic workers and firms in as much as the profits do actually accrue to all.

The Program Committee has issued a call for contributions to the convention program. This is an opportunity for each member to discharge the obligation he owes to his fellows on account of the hundreds of valuable contributions which have been given by others during the past twenty-six years. This opportunity is not for an exclusive few; it is for all members.

The Membership Committee has drawn attention to the opportunity to serve self by inviting others to join this coöperative educational enterprise. The SOCIETY does not need joiners, but it does need an extension of its opportunities for service and the opportunity and strength to make its services of more value to each member. These larger opportunities for service can be had only through a larger membership.

President Greaves-Walker, Messrs. Zopfi, Flint, Riddle and others have drawn to the attention of corporations their opportunity for self service in corporation memberships by thus making possible and more effective these organized educational opportunities to their employees.

The obligation of each ceramist and of each ceramic concern is obvious The AMERICAN CERAMIC SOCIETY is the agency through which these obligations may most easily and most effectively be discharged.

The convention program—the membership invitation—the corporation membership support—the perpetual membership endowments—these are opportunities for discharging the indebtedness you owe to yourself and to your fellow ceramists.

ACTIVITIES OF THE SOCIETY

PRESIDENT'S PAGE

We have reached the crucial point in the year so far as our finances are concerned. From this time until the first of the year when the 1924 dues begin to come in the outgo will exceed the income.

When the Budget Committee decided last year to lay out a program calling for an expenditure of $40,000 they foresaw the necessity of drawing upon the last of our financial reserves to make up a certain deficit. Every business man knows, however, that additional investment is always necessary to enlarge a business and the Budget Committee decided to invest in order to enlarge and extend the Society.

That their decision was wise is now beyond doubt, as this year will prove to be the greatest in the history of the Society both as to growth and accomplishments.

Every effort must be made by every member to increase the membership and advertising, the only two sources of income that can help us during the balance of the year to reduce the deficit.

Next year we must budget at least the same amount as this year if not more. The time has arrived when the Society should have an Editor so as to release the Secretary for the tremendous amount of work that lies before him. This would mean an additional $3000 or $4000 per year, but it would be worth all we put into it.

* * *

Splendid response has been received from the various committees and the real work of the year has begun. Difficult as it is to carry on committee work, much can be accomplished by a live chairman and it is to these chairmen we are looking for results before February 1st.

* * *

Have you thought of taking out a perpetual personal membership? Many members can easily afford the $200 fee and it would be a splendid thing to be among the first to contribute to the Society's endowment.

* * *

In addition to the splendid entertainment given the members at the Summer Meeting the Detroit Section has put itself decidedly on the Society's map by holding a large and successful meeting at which many members of other technical and engineering societies were present. I know it will give every member pleasure to know that another Section has been so successfully launched.

NEW MEMBERS RECEIVED FROM SEPTEMBER 15 TO OCTOBER 15

PERSONAL

A. R. Anderson, 607 Int. Southern Bldg., Louisville, Ky., President Kentucky American Clay Company.

J. Antonio de Artigas, 4 Arrieta, Madrid, Spain, Scientific Glass Laboratory.

John Betteley, 314 Fielding Ave., Ferndale, Mich., Clay Inspector and Thrower.

W. A. Darrah, 79 W. Monroe St., Chicago, Ill., Consulting Engineer.

George E. Ford, 50 Church St., New York, N. Y., District Sales Manager, A. P. Green Fire Brick Company.

Pierce W. Ketchum, 203 Ceramics Bldg., University of Illinois, Urbana, Ill., Research Graduate Assistant.

William H. Leary, 907 E. 75th St., Chicago, Ill., Advance Pyrometer Service Company.

George W. Lester, 2176 McClellan Ave., Detroit, Mich.

Robert Macdonald, Jr., General Abrasive Company, Niagara Falls, N. Y., Metallurgist.

Frank Cameron Schultz, 348 Chittenden Ave., Columbus, Ohio (Student Member).

E. L. Simpson, 20th and State St., East St. Louis, Ill., Production Engineer, American Range and Foundry Company.

George A. Speer, 116 Hyland Ave., Ames, Iowa (Student Member).

S. D. Swan, 220 West 42nd St., New York, N. Y., Research Chemist, The Dentist's Supply Company.

Marion I. Walter, 3226 Warder St., N. W., Washington, D. C., Ceramic Division, U. S. Bureau of Standards.

Guy A. Young, 33 Elmwood Ave., Bloomfield, N. J., Engineer, Capstan Glass Company.

CORPORATIONS

Crane Enamelware Company, Chattanooga, Tenn., H. W. Powell, Gen. Mgr.

Wishnick Tumpeer Chemical Company, 365 E. Illinois St., Chicago, Ill., Michael Agazim, President.

Membership Committee boosters have the following record:

Name	Personal	Name	Personal	Corporation
E. N. Bunting	1	Henry J. Mitchell	2	
Edward Burkhalter	1	D. A. Moulton	1	
G. W. Cooper	1	James T. Robson	1	
H. D. Foster	1	H. E. Davis		1
H. S. Kirk	1	Office	5	1
John J. Maroney	1		—	—
			15	2

No resignations, Net Gain 17

Personal	Corporation	Total Roster Oct. 15
1862	254	2116

PERSONAL NOTES OF SOCIETY MEMBERS

M. G. Babcock, formerly sales representative of the Laclede-Christy Clay Products Company has succeeded P. M. Offill in charge of their Pittsburgh office.

George A. Balz has asked that his address be changed from Rahway, N. J., to Perth Amboy, N. J.

Harry Barkby, formerly manager of the Chelsea China Company, New Cumberland, W. Va., has a similar position with the Warwick China Company, Wheeling, W. Va.

Charles E. Bates has taken a position with the Beaver Falls Art Tile Company, Beaver Falls, Pa. Mr. Bates was previously with the National Fire Proofing Co., of Perth Amboy, N. J.

A. G. C. Breese has moved from Bridgeton, N. J., to 135 Bridge Street, Manchester, Mass.

Trevor Caven, who has been consulting engineer with the Quigley Furnace Specialties Company is now located at 564 W. 173rd St., New York, N. Y.

Sanford S. Cole, formerly of Hornell, N. Y., is now located at 203 Ceramics Bldg., Urbana, Illinois.

R. R. Danielson, Secretary of the Enamel Division of the AMERICAN CERAMIC SOCIETY, has returned to the Bureau of Standards, Washington, D. C., having resigned his position with the Beaver Enameling Co., Ellwood City, Pa.

Redfield Dinwiddie, until recently ceramist for the Babcock and Wilcox Co., East Liverpool, Ohio, is now living in Somerville, N. J.

A. H. Fessler has accepted a position as manager of the Hamilton Clay Manufacturing Company, Hamilton, Illinois. Mr. Fessler has been with the U. S. Bureau of Mines on the laboratory car "Holmes."

G. M. Galvin, recently of the U. S. Naval Fuel Oil Testing Plant, Navy Yard, Philadelphia, Pa., is now with the Jointless Fire Brick Company, Trenton, N. J.

T. W. Garve has moved from Brazil, Ind., to Washington, Pa. Mr. Garve is employed with the Findlay Clay Pot Company.

Robert E. Gould, formerly of Columbus, Ohio, is now living at 512 E. 2nd Street, Flint, Mich.

Ralph E. Hanna has moved from 149 Rector Street, to 272 McClelland Street, Perth Amboy, N. J.

M. E. Holmes has taken a position with the United States Gypsum Company, 205 West Monroe St., Chicago, Illinois. Mr. Holmes has been manager of the chemistry department of the National Lime Association, Washington, D. C.

Karl M. Kautz, 1923 graduate in ceramics, Ohio State University, is now with the American Range and Foundry Company, St. Louis, Mo.

J. H. Knote, whose address has been unknown for some time has notified the Secretary's office that he is with the J. H. Gautier Co., Jersey City, N. J.

Raymond B. Ladoo, of the Southern Minerals Corporation who has been located at the Washington, D. C. office will have his headquarters during the winter at Cleveland, Tenn.

Walter T. Lippert has moved from Alton, Ill., to 85 North Laurel St., Bridgeton, N. J.

G. F. Metz, sales manager of the Hardinge Company has been transferred from the New York office to York, Pa.

L. V. Reese is now corporation representative for the U. S. Metals Refining Company, taking the place of Francis R. Pyne who has left that company.

L. M. Richard has moved from Ocean Park, Calif., to 1032 7th St., Santa Monica, Calif.

Malcolm A. Schweiker, general manager of the Empire Floor and Wall Tile Company of New York City is now located at the Worcester, Pa., office.

W. L. Shearer, of the Ceramic Division, Bureau of Standards, Washington, D. C., has accepted a position as instructor in the Department of Ceramics at Rutgers College, New Brunswick, N. J.

George C. Swift has moved from 2029 E. 115th St., to 1031 Greyton Rd., Cleveland, Ohio.

Royal W. Taylor, of the Canton Stamping and Enameling Company, has moved from 707 12th Street, N. W., to 1415 Arnold Ave., N. W., Canton, Ohio.

Robert Twells, Jr. has moved from Highland Park, Mich., to 309 Ardmore Drive, Ferndale, Mich.

C. A. Underwood, formerly of the General Refractories Company, is now with the Queen's Run Refractories Co., Inc., 141 Milk St., Boston, Mass.

Ernest W. Westcott has left the Niagara Falls Alkali Company as Research Engineer and is now with Kalmus, Comstock and Westcott of Niagara Falls, N. Y.

Stefan Wiester has moved from Belleville, Illinois, to 1903 S. 4th Street, Ironton, Ohio.

A. E. Williams, Secretary of the Glass Division, AMERICAN CERAMIC SOCIETY, has left the Bureau of Standards, Washington, D. C., and is located in Elmira, N. Y., with the Thatcher Manufacturing Company.

ORGANIZATION OF DETROIT SECTION

By H. F. ROYAL

At the request of A. F. Greaves-Walker a section of the AMERICAN CERAMIC SOCIETY for the Detroit district has been organized by Frank H. Riddle. When the organization of this section was contemplated it was realized that a large, very active section could not be built up by appealing solely to the members in the Detroit district, because these members are too widely scattered. A large, active section could be assured through discussions of vital and general interest to Detroit's gigantic industries. The subject of most interest clearly was refractories.

The Detroit district uses millions of fire brick yearly and many Detroit plants are engaged in writing specifications for the purchasing of refractories. It was decided, therefore, to have as the subject for discussion at the first meeting "Specifications for Refractories." A. V. Bleininger kindly agreed to deliver the address on this subject.

A banquet preceded the first meeting held on October 4 and eighty men responded to the several hundred notices which were sent out. Mr. Riddle acted as temporary chairman. The Kentucky Fire Brick Manufacturers' Association was represented and men were present from many of the large plants including the Ford, Dodge Brothers, Cadillac, Hudson, Maxwell, Packard, Timken Axle plants and others; the Detroit Edison and Detroit City Gas Companies were well represented; Professors Peck and Kraus of the Mineralogical Department were present; five members of the SOCIETY came from Flint and Mount Clemens; and fifteen men were present representing various sales offices in the district. The sales offices and manufacturers' representatives displayed a great interest in the meeting and were responsible for the presence of several interested men

Mr. Riddle outlined the aims of the SOCIETY and the purposes in view in the formation of a local section. His remarks were followed by short speeches and expressions of interest by many of those present. It was clearly evident that the men present were really interested in the SOCIETY and in the support of a local section. A motion was carried unanimously that such a section be formed. The following men were nominated by Robert Twells and were elected to serve for one year:

A. B. Peck, Chairman
P. D. Helser, Vice-chairman
H. F. Royal, Secretary-Treasurer
F. H. Riddle, Councilor

Dues were set at one dollar a year.

Mr. Bleininger's address was followed by a brief discussion.

Two more meetings on the subject of "Refractories" are being planned. The list of members in the Detroit Section is given below:

E. B. Baker, Detroit-Star Grinding Wheel Co. Detroit, Michigan.
H. Bill, Champion Porcelain Co., Detroit, Michigan.
J. Betteley, Champion Porcelain Co., Detroit, Michigan.
K. Boyne, Ford Motor Car Co., Highland Park, Michigan.
W. A. Carter, Detroit Edison Co., Detroit, Michigan.
W. J. Cluff, F. B. Stevens, Inc. Detroit, Michigan.

J. Disney, F. B. Stevens, Inc., Detroit, Michigan.
R. C. H. Duclor, F. B. Stevens, Inc., Detroit, Michigan.
J. F. Gottron, Smith, Gottron, Berry Corp., Detroit, Michigan.
S. E. Hemsteger, Mt. Clemens Pottery Co., Mt. Clemens, Michigan.
P. D. Helser, A-C Spark Plug Co., Flint, Michigan.
O. W. Kraft, c/o Wolverine Porcelain & Enameling Co., Detroit, Michigan.
H. M. Kraner, A-C Spark Plug Co., Flint, Michigan.
G. S. Kennelley, Detroit, Michigan.
M. D. Lucas, Detroit, Michigan.
C. R. Moore, Champion Porcelain Co., Detroit, Michigan.
J. E. Purtell, Ashland Fire Brick Co., Ashland, Kentucky.
F. H. Riddle, Champion Porcelain Co., Detroit, Michigan.
J. W. Rollinson, Detroit, Michigan.
W. C. Steif, Mt. Clemens Pottery Co., Mt. Clemens, Michigan.
A. I. Snyder, Detroit City Gas Co., Detroit, Michigan.
R. A. Smart, Detroit, Michigan.
R. Twells, Champion Porcelain Co., Detroit, Michigan.
A. A. Treadway, Detroit, Michigan.
J. Watt, Ford Motor Car Co., Highland Park, Michigan.
L. E. Worthing, Detroit City Gas Co., Detroit, Michigan.
Taine McDougall, A-C Spark Plug Co., Flint, Michigan.

CALIFORNIA LOCAL SECTION TO ORGANIZE

The temporary organization of the new California Local Section of the AMERICAN CERAMIC SOCIETY was effected on October 15 at Los Angeles. Fifty men interested in the Ceramic industry were in attendance and all very eager to bring about this organization. In addition to this number about twenty men in the San Francisco district have expressed their desire to coöperate in this Section and undoubtedly will become members of the Section. The petition was signed by forty-four members. The temporary officers for the organization are:

President, A. Malinovszky
Vice President, G. R. Boggs
Secretary-Treasurer, T. S. Curtiss
Councilor, F. B. Ortman

MEETING OF THE COMMITTEE ON STANDARDS[1]

The Committee on Standards met on September 19, 1923 in New York City at Grand Central Palace. The following members of the Committee attended: R. F. Geller, Chairman, M. C. Booze, E. C. Hill, W. T. Stephani, R. M. Howe. R. C. Purdy was also present at this meeting.

The Committee was addressed by the chairman relative to the importance of the work on specifications and need for combined and unstinted efforts, on the part of every committee member, to expedite the establishment of specifications. The question of rearranging the committee into two groups, the first consisting of the chairman and four members of the SOCIETY who are actively interested in the technical phase of Ceramics to function as the Standards Committee proper, and the second group to be composed of the chairman, together with the several divisional Standards Committee chairmen, to

[1] By R. F. Geller, Chairman.

function as an advisory group, was discussed. The plan was favorably received, but the committee was advised that the present organization was written into the Constitution of the SOCIETY.

The subject of specifications was then taken up by the committee and the following business transacted:

A. It was passed that the Suggested Specifications for Whiting be revised to allow a maximum of 2% magnesium carbonate in class 1 whiting, and that the revised form be submitted to the General Secretary for vote with the recommendation that they be adopted as standard.

B. It was passed that the Proposed Tentative Specifications for the Purchase of Flint be resubmitted to the Divisional Committee by the General Secretary with the following suggestions and recommendations:

(1) That the manufacturer state the original form of silica from which the flint was obtained.

(2) That it be specified that the flint be shipped in paper lined cars.

(3) Regarding lime content that the specifications read, "not more than" the required per cent in order to provide for some variation.

(4) That the specifications be changed to include revisions suggested in the published discussion.

(5) That further consideration be given to the specifications for the determination of calcined color and fusing temperature.

(6) That provision be made for retest.

(7) That the specifications be submitted to the producers for consideration.

(8) That the specifications be put into a general or standard form, such as has been adopted for all AMERICAN CERAMIC SOCIETY specifications. It was further recommended that the placing of the specifications in their final form be deferred until the Bureau of Standards has completed its present investigation on the Effect of Various Types of Flint on Whiteware Bodies.

C. It was passed that the Tentative Specifications for Feldspar be resubmitted to the Divisional Committee with the following recommendations:

(1) That a special committee be appointed to devise a method for the determination of the relative viscosity of feldspar.

(2) That further consideration be given to the K_2O and Na_2O ratios as given in the specifications.

(3) That the specifications be so worded as to make clear the fact that a, b and c grades do not imply materials of decreasing quality.

(4) That the specifications be put into standard form.

D. Recommended Specifications for Limestone, Quicklime and Hydrated Lime. It was passed that these specifications be submitted to the General Secretary for vote by the SOCIETY.

E. Tentative Specifications Published in 1921–22 Year Book.

(1) Regarding Proposed Method for Sampling of Clay Deposits it was passed that J. Spotts McDowell be appointed a special agent to devise a more satisfactory method of sampling.

(2) Tentative Method for Sampling Ceramic Materials as Delivered. Under item (3) it was passed that this be revised to read "the standard gross sample shall not be less than 0.1% of the total shipment." It was further passed that this Method in the revised form be submitted to the General Secretary for vote by the SOCIETY as standard.

(3) It was passed that Tentative Methods for Chemical Analysis, Slag Test and Transverse Strength be further considered by the committee.

(4) It was passed that the Method for Slaking be submitted to the General Secretary for vote by the SOCIETY as standard.

(5) It was passed by the committee that the Scale for Testing Sieves be submitted to the General Secretary for vote by the SOCIETY as standard.

(6) It was passed by the committee that the Tentative Definitions for Clay Refractories be submitted to the General Secretary for vote by the SOCIETY as standard.

(7) Tentative Methods of Testing Electrical Porcelain. It was passed by the committee that this be resubmitted to the Divisional Committee with the recommendation that F. H. Riddle be appointed special agent to reconsider them.

(8) Tentative Method of Test for Refractory Materials under Load at High Temperature It was passed by the committee that this be submitted to the General Secretary for vote by the SOCIETY as standard.

(9) The committee decided to give further consideration to methods and apparatus published in the Appendix.

Following this business the committee adjourned. The next meeting will be held at the time of the Annual Meeting of the SOCIETY in February, 1924, at Atlantic City.

NOTES AND NEWS

EDWARD ORTON, JR., NOW BRIGADIER-GENERAL

Military Record

Sergeant Major, 6th training Regiment, Citizens Training Camp, Plattsburgh, N. Y., August, 1916.

Commission to Major Quartermaster Corps, Officers Reserve Corps, July 5, 1917.

Called to active duty, Fort Sam Houston, Texas, May 9, 1917, assigned to Motor Transport Division, Quartermaster Corps.

Transferred to Washington, D. C., August 18, 1917, office of the Quartermaster General in charge of Engineering Section, Motor Transport Division.

Promoted Lieutenant-Colonel, in charge Service Division, Motor Transport Corps, September 6, 1918.

Awarded Distinguished Service Medal for service in standardization of motor trucks and equipment, May, 1919.

Discharged, June 2, 1919.

Commissioned Colonel, Quartermaster Corps, Officers Reserve Corps, September 12, 1919.

Courtesy Harris & Ewing

BRIGADIER-GENERAL EDWARD ORTON, JR.

Commissioned Brigadier-General, Quartermaster Corps, Officers Reserve Corps, September 27, 1923.

AUTOGRAPHIC EXPANSION APPARATUS

For Measurement of the Temperature Coefficient of Expansion of Any Material Available in Rod Form

General

The difficulty of accurately measuring the thermal expansion of metals, glass, porcelain and other solid material by previously existing methods has led to the development of a new piece of apparatus inherently accurate and extremely simple.

The measurement of the temperature coefficient of expansion by most existing methods shows a result applicable to only one temperature and does not give a complete picture of the expansion characteristics over a complete temperature range. The apparatus described below does give such a picture in a thoroughly comprehensive form.

Description

Figure 1 gives a general idea of the appearance of the instrument. It consists essentially of a camera mounted on a common base with an electrical heating unit and

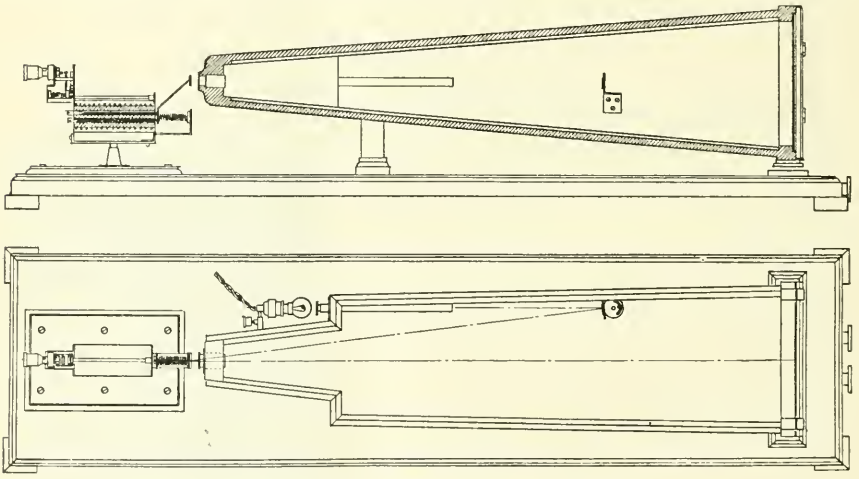

FIG. 1.—Sketch of expansion apparatus.

an adjustable source of illumination. The over-all length is approximately 48 inches, height 12 inches, width 13 inches. The electrical heating unit is wound on an iron core. It is provided with a thermostatic device and an auxiliary automatic switch so that at a temperature of about 200°C an auxiliary resistance is automatically cut out and at the temperature at which the test is to be discontinued the current to the heating unit is automatically cut off.

In the core of the heating unit are four holes running through it: one is to receive a thermocouple for accurate determination of temperatures; a second contains a quartz glass rod 10 cm. long which is the standard against which comparison of the sample is made. A third contains a standard metal rod with known expansion such as platinum or constantan. The fourth is to receive the sample rod which is to be tested.

One end of each rod is held against an adjustable screw at the back of the furnace; the other end is ground to a conical shape and is free to expand. The points of these

rods are held against a plate which is pressed against them by a coiled spring. To this plate is fixed a mirror by a suitable support. The expansion of the rods with respect to one another creates a movement of the plate pressed against them which in turn is conveyed to the mirror. The movement of the rod with known expansion, *i. e.*, either platinum or constantan, creates a movement so that a beam of light which is reflected by the mirror moves in a horizontal direction. The expansion of the rod which is being investigated creates a movement of the mirror which deflects the light in a vertical direction. The resulting graph is, therefore, a curve of which the horizontal ordinate corresponds to temperature and the vertical ordinate corresponds to expansion. The constants of the apparatus give a magnification of approximately 165 times.

The lamp which provides the beam of light has an adjustable screw and shutter, etc., so that the proper degree of illumination is readily obtained. The adjustment screws holding one end of the rods provide a means so that the test is started with the beam of light focused on the lower right hand corner of the ground glass objective plate. Sensitized photographic paper with millimeter cross-section lines is used exactly as a plate is used in a camera.

When the rods and light are adjusted, a plate holder is inserted in the back of the camera, the slide removed and the furnace started. The thermostat is then set at the temperature where the test is to be discontinued. The operator watches his pyrometer instrument and drops the shutter in front of the illuminating bulb at regular temperature intervals such as 100° or 200°. This shuts off the light for a brief interval causing a blank space about 1 mm. long on the photographic reproduction.

From the foregoing description it will be seen that the apparatus is almost completely automatic, entirely so except when accurate temperature measurements are required. The results are shown on cross-section paper in the form of a curve whose magnification is 165 times.

Formula and Tables

The formula for computing the expansion of a material in millimeters per meter is as follows:

$$Xt = \frac{10\ Lt}{V} + Xqt$$

where

Xt = the expansion of a rod in millimeters per meter at the temperature t.
Lt = height of curve from horizontal base line at the temperature t. This is read directly from the plot made by the apparatus.
V = the magnification of the apparatus, *i. e.*, 165.
Xqt = the expansion of the quartz glass rod in millimeters per meter at the temperature t. (See table below.)

	Platinum	Pure iron	Constantan	Quartz glass
25– 100° Cels.	0.678	0.99	1.14	0.041
25– 200° Cels.	1.61	2.22	2.74	0.107
25– 300° Cels.	2.56	3.66	4.43	0.178
25– 400° Cels.	3.54	5.20	6.19	0.244
25– 500° Cels.	4.55	6.85	8.03	0.296
25– 600° Cels.	5.58	8.61	....	0.350
25– 700° Cels.	6.64	....	....	0.390
25– 800° Cels.	7.72	....	....	0.440
25– 900° Cels.	8.82	....	....	0.490
25–1000° Cels.	9.97	....	....	0.530

Charles Engelhard, Inc.
30 Church St.
New York City

NOTES FROM THE U. S. BUREAU OF STANDARDS

Trial Run of New Cupola Furnace

As mentioned a short time ago, the metallurgical division of the Bureau has recently installed a small cupola furnace for melting cast iron, which will be of great value in connection with its research work on ferrous metals. A trial "run" of this equipment was made during the past month. It was found possible to melt the cast iron ready for pouring within four hours after starting the fire. Three hundred pounds of iron have been melted and poured into test bars and pigs. The character of the iron has not yet been determined, but so far as the operation and behavior of the furnace are concerned, the trial run was a pronounced success.

Cast Iron for Enameling Purposes

In connection with the Bureau's investigation of the enameling of cast iron, several typical castings have been received and have been coated with representative enamels. This work is still in progress, and all the castings will be examined for blistering. Microphotographs will be made of the surfaces in order to detect any changes produced by the enameling operation. It is hoped that the cause of blistering of these castings will be discovered, and means developed to control and if possible eliminate it.

Effect of Sea Water on Glass

Some work was carried out during the past month on the effect of sea water on various types of glass, to determine the best kind to use for the lenses of signal lights on shipboard. From the data which the Bureau has secured, the damage which these lenses often suffer appears to be caused by the evaporation of sea spray, which leaves a deposit of salt on the surface of the lens. This eventually etches the glass. Three types of glass, boro-silicate, lead glass, and ordinary soda-lime glass, have thus far been investigated. Under the conditions of the test, lead glass etched considerably, while the other two did not.

New Micrometer for Accurate Measurements

A micrometer of extraordinary accuracy has been constructed by the Bureau of Standards for determining the diameter of some 12-inch porcelain cylinders to be used in electrical measurements. Measurements made with the new instrument are independent of the observer and have an accuracy of 0.0001 of an inch. In order to obtain this degree of accuracy, it is necessary to operate the micrometer from a distance and to take readings from it through a telescope so that the heat of the observer's body will not warp the thick iron ring enough to cause an error. Both the instrument and the cylinder which it is employed to measure must be kept in a constant-temperature box during the measurement. The micrometer consists of a cast iron ring large enough to pass easily over the 12-inch cylinders. On opposite sides are the micrometer screw and the contact pin, while at right angles to these are adjustable lugs for centering the device on the cylinder. The micrometer screw is driven by a tiny electric motor and the ring with its attachment, including the motor, is suspended by three light rods and can move freely for a short distance.

In making a measurement the micrometer screw is revolved by the motor through a train of gears, the motion of the screw pushes the cylinder against the contact pin and when this contact is made, the motor circuit is broken thus stopping the screw. The cylinders which are to be measured will be wound with wire on a precision lathe and will form inductance coils of very accurate construction, the inductance of which can be calculated from the dimensions. They will be used for research work in a program

for standardizing all of the electrical units in terms of the fundamental standards of length, mass, and time.

Study of Architectural Properties of Terra Cotta

During the past month 110 balusters and 68 coping blocks, fired in commercial kilns, were forwarded to the Bureau for test and have been set in mortar and exposed for weathering. A duplicate set is being saturated with paraffine and will also be subjected to the weathering tests. Absorption is being determined on balusters, and tests for this property, as well as for transverse strength, have been made on specially prepared bars representing five bodies used in the manufacture of terra cotta. The data thus secured will be correlated with the heat treatment which the respective pieces receive in firing.

Investigation of Potters' Flint Including the Effect of Kryptocrystalline Flint in Pottery Bodies

Eight sanitary ware bodies made with flint under investigation by the Bureau have been fired and tested for transverse strength, porosity, and resistance to quenching. The porosity and strength of the bars varied considerably, indicating the need of a longer soaking period in finishing these burns, and for this reason the work will be repeated.

The strengths of the fired bodies did not show a regular variation according to type of flint used, such as was found in the case of vitreous china. The work, therefore, needs to be checked, and additional samples of flint have been requested from the producers.

In connection with the porosity determination, various methods and periods of soaking have been tried in order to show their relation to the method used in this investigation. A few experiments on drying the saturated pieces have also been carried out. Quenching tests made from 200°C to water at 30°C confirm previous indications that bodies made with the kryptocrystalline type of flint are more resistant to failure than those made with sand or rock quartz.

Standard Specifications for Whiteware Pottery

A committee of the Vitrified Chinaware Manufacturers met with the Committee on Chinaware and Glassware of the Federal Specifications Board on July 10 and three sets of chinaware were agreed upon, *viz:* (1) $^1/_2$ thick vitrified chinaware for enlisted men's dining service as used by the Army, Navy and Marine Corps; (2) vitrified hotel chinaware for all government dining service and hospital service, where desired; (3) $^1/_4$ thick itrified chinaware for hospital service. Drawings of the different articles are now being made so that each purchasing department and manufacturer can be supplied with a set of blueprints.

Physical Properties of Clay Bodies as Affected by Drying Treatment

Tests have been made upon the physical properties of various clays and body compositions to determine the effect of drying treatment. Some of this work is being carried out in coöperation with the investigation of the effect of various potters' flint in semi-porcelain bodies. In this way drying effects are being traced from the plastic to the burned state, and the effect upon the drying behavior of variation in the body composition is noted.

Observations are being made to determine the effect of gravity upon the uniformity of drying and shrinkage in large commercial pieces. It is expected that it will be possible to establish a set of standard laboratory drying tests, similar to the firing tests now used,

and from these the ideal drying treatment and resulting effects may be reported for any clay or body which may be submitted to the Bureau for examination.

Plasticities of Clay

Work is in progress on the development of a penetration type of plastometer to be substituted for the capillary tube plastometer. The latter form is not applicable to very stiff paste or bodies, such as those used by potters in the molding of forms, but is used in the study of clay slips employed in the casting process, but not the study of the molding range.

With the capillary tube plastometer, the shearing stress is varied by changing the total pressure acting on the material, while in the penetration type, the shearing stress is varied by changing the pressure of the penetration rod.

Dictionary of Specifications

Work has been started at the Bureau of Standards on the compilation of material for a dictionary or handbook of specifications for supplies purchased by Federal, State and Municipal governments and public institutions. This work grew out of a meeting held in May, 1923, of State Purchasing Agents from all over the country, and at which the coöperation of the various states was assured in this matter.

On July 11, a conference was held of various national organizations interested in the preparation and unification of purchase specifications and in their use from the point of view of both the producer and the consumer. This conference was called for the purpose of organizing an advisory committee to coöperate with the Department of Commerce and the National Conference of State Purchasing Agents in the work of formulating purchase standards, specifications, and tests. Although no meeting of this advisory committee has yet been held, the various organizations represented are coöperating actively in the actual work of compiling the material for the dictionary, and a great deal of information has been supplied.

Correspondence conducted with the officers of trade associations and the purchasing agents of a large number of municipalities and public institutions has established the fact that all the individuals and groups for which the dictionary of specifications is being prepared will welcome its appearance enthusiastically and coöperate actively in the preparation.

A collection is now being made of all available specifications prepared by the various departments and independent establishments of the Federal government and those used by State and Municipal governments, public institutions, and the important national trade associations, and technical societies. These specifications are being thoroughly card-indexed and classified. Care is being taken to pick out those specifications which are most urgently needed, and due consideration is being given to the attitude of purchasers and consumers toward the existing and the proposed specifications.

GOVERNMENT EXPERTS PRODUCE LARGEST LENSES EVER MADE FROM AMERICAN OPTICAL GLASS[1]

Department of Commerce Describes Accomplishment as "Marked Advance" in American Industry

The largest lenses so far made from American optical glass have just been completed at the U. S. Bureau of Standards, it was announced today at the Department of Commerce.

[1] Department of Commerce, Washington, D. C.

The difficulties of securing a good enough piece of glass increases greatly as the size increases, the government experts say, and the production of 12-inch lenses having a combined focal length of 12 feet 8 inches represents a marked advance over what was possible in America a few years ago. It is considered only a question of time, however, before much larger lenses can be made at the Bureau of Standards, according to experts.

In discussing the significance of the accomplishment, Dr. G. K. Burgess, Director of the Bureau of Standards, stated that until the beginning of the war in 1914 the art of making optical glass was unknown in this country, all glass used here being imported from Europe. When the European supply was cut off the Bureau of Standards began research looking towards the development of the industry in America. By the end of the war the plant built at the Bureau of Standards in Washington was able to turn out large quantities of excellent glass and several of the large optical manufacturers had built plants of their own. But no lenses much over five inches could then be made here, for the production of large lenses is a branch by itself requiring special care.

Optical glass is made in pots holding a thousand pounds each, and if the pot is cooled to room temperature within a few days the glass will break into many small pieces. These cannot be welded together, so the lens cannot be larger than the largest piece. If several weeks are taken for the cooling of the pot the glass may come out in one big piece, but great care is required in the making in order that this large piece may be sufficiently free from defects to be used as a single lens. Difficulties are encountered in the annealing of such pieces.

Final Polishing May Take Weeks

The lens is molded to nearly the proper form and is ground to the correct shape as exactly as is possible with the best of measuring instruments. But the final finishing must be done by hand and all errors of as much as a millionth of an inch corrected. The surface is carefully polished with rouge, a little here and a little there, until tests show it to be correct.

The test used for showing errors in the lens consists, in effect, of forming an artificial star with the lens and then viewing it through the lens. A tiny pinhole in the metal chimney of an oil lamp is placed at the focus of the lens, and a mirror behind the lens reflects the light from this artificial star back through the lens again to an eyepiece placed beside the lamp. The light thus passes through the lens twice and the effect of defects is thereby exaggerated. A patient study of the lens then permits them to be located and corrected. As there were four surfaces to this pair of lenses the magnitude of the task can well be imagined. The work was done by Mr. John Clacey of the Bureau staff, and occupied a large part of his time from the first of April to the middle of July.

These lenses form what is known as an achromatic combination. One is of crown glass, the other of flint glass, and the combination is so designed as to bring light of all colors to a focus at the same point, whereas with a single lens the focus is different for different colors. It will be used by the Bureau of Standards for various kinds of research in optics and possibly for making astronomical observations. It will be especially valuable in optical problems which require the use of a beam of parallel light.

CALENDAR OF CONVENTIONS[1]

Organization	Date	Place
AMERICAN CERAMIC SOCIETY (Annual Meeting)	Feb. 4–8, 1924	Atlantic City
American Concrete Institute	Feb. 25–28, 1924	Chicago
American Face Brick Assn.	Dec. 4–6, 1923	French Lick, Springs Ind.
American Face Brick Assn. (Southern Group)	Nov., 1923	West Baden, Ind.
American Institute of Electrical Engineers	Feb. 4–7, 1924	Philadelphia
American Malleable Castings Assn.	Jan., 1924	Cleveland, Ohio (?)
American Road Builders' Assn.	Jan. 14–18, 1924	Chicago
American Zinc Institute	May, 1924	St. Louis, Mo.
Assn. of Scientific Apparatus Makers of U. S. A.	April 18, 1924	Washington, D. C.
Common Brick Mfrs. Assn. of America	Feb. 11, 1924	Los Angeles, Calif.
Gas Products Assn.	Jan., 1924	Chicago
Hollow Bldg. Tile Assn.	Jan., 1924	Chicago (?)
Institute of Metals, Div. of American Institute of Mining and Metallurgical Engineers	Feb., 1924	New York City
Natl. Assn. Brass Mfrs.	Dec., 1923	New York City
Natl. Assn. of Stove Mfrs.	May 7–8, 1924	New York, Hotel Astor
Natl. Bottle Mfrs. Assn.	April 27, 1924	Atlantic City
Natl. Brick Mfrs. Assn.	Jan. 28–Feb. 2, 1924	Cincinnati, Ohio
Natl. Builders Supply Assn, Inc.	Feb., 1924	Chicago (?)
Natl. Electric Light Assn.	May or June, 1924	
Natl. Glass Distributors Assn.	Dec. 4–5, 1923	Pittsburgh, Pa.
Natl. Paving Brick Mfrs. Assn.	Dec., 1923	
Penna. Gas Assn.	April, 1924	Atlantic City
Portland Cement Assn.	Nov. 19–21, 1923	New York City
Society of Promotion Engineering Education	July, 1924	Boulder, Colo.
Stoker Mfrs. Assn.	April or May, 1924	(?)
U. S. Potters Assn.	Dec., 1923	Washington, D. C.
Western Society of Engineers	June 4, 1924	Chicago

[1] Further information may be secured through the Chamber of Commerce of U. S., Washington, and World's Convention Dates, New York, N. Y

BULLETIN

of the

American Ceramic Society

A Monthly Publication Devoted to Proceedings
of the Society, Discussions of Plant Problems, Discussions
of Technical and Scientific Questions and
Promotion of Coöperative Research

Edited by the Secretary of the Society Assisted by Officers of the Industrial Divisions

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EDITORIAL

SCIENTIFIC RESEARCH ENTERS NEW ERA

On page 150, *Bulletin* section of the June issue of this *Journal*, appeared these paragraphs.

> Scientific research, affording new channels for the aspirations of the engineer, is entering upon a new era both here and abroad. Following the $500,000 gift of Ambrose Swasey of Cleveland, making possible the organization of Enginering Foundation, comes news from London that Sir Alfred Yarrow has given the same amount to the Royal Society for the same purpose.
>
> The philanthropy of Sir Alfred, who is an honorary member of the American Society of Mechanical Engineers, is characterized as another step toward the identity of effort which engineers and men of science are striving to accomplish throughout the Anglo-Saxon world. "I should like to record my firm conviction that a patriotic citizen cannot give money, or leave it at his death, to better advantage than towards the development of science, upon which the industrial success of the country so largely depends," said Sir Alfred in his deed of gift.

Since then other large endowments have been made for industrial research. The American Chemical Society has an annuity of $25,000 to be given as prize for the most valuable contribution to the knowledge of chemistry or chemical processes. The National Research Council has a

long list of endowments and research funds. The number of manufacturing concerns having a well equipped laboratory and well trained research force is increasing. All the technical associations and societies have rapidly growing rosters and are engaged to a continually increasing extent in the promotion of scientific education and industrial research. The record of membership increase in the AMERICAN CERAMIC SOCIETY, as here shown, typifies an increasing realization on part of the ceramic industrialists of the value of technical application of scientific research which is paralleled in nearly all industrial lines.

	1922 12 months			1923 11 months		
	Personal	Corporation	Total	Personal	Corporation	Total
New Members Secured	359	84	443	392	73	465
Losses	98	7	105	73	5	78
Net Increase	261	77	338	319	68	387
Roster Total	1611	216	1827	1930	284	2214

It is not due altogether to the effort of the membership committee nor altogether to the substantial value there is in the accomplishments of the SOCIETY that during the past eleven months the SOCIETY has added a larger number to its roster and at the same time had a smaller number of withdrawals than during the previous twelve months. To no small degree these data reflect an increasing appreciation by ceramic executives and plant operators of the necessity of keeping in touch and abreast with the rapidly accumulating amount of fundamental facts and principles and of their industrial application.

The ceramic industries find it profitable to support collegiate schools and the federal and state research departments. They find profit in the trade press and the technical literature. But there is no means whereby the information from and through these several sources can be applied except by the plant operators. The plant operators must obtain, understand and apply the information.

The program of service on which the AMERICAN CERAMIC SOCIETY is engaged is to stimulate research, to analyze facts and methods, standardize materials and products, publish results of original investigations, abstract the world's literature, publish bibliographies, and by every other practical means to make available to the operators of ceramic factories all the information most pertinent to manufacturing the highest quality of wares most economically. This is an extension educational work that is imperative to solid welfare of the ceramic industries.

It is in support of this sort of service that large donations and endowments are being made, for which large organizations are supported and for which many concerns maintain extensive laboratories. It is because of the value in such services that nearly all trade associations in all industrial lines are supporting technical research.

It has been proven that when the manufacturing concerns generally, large and small, are coöperating in working out their common fundamental problems that larger benefits accrue and these more promptly.

The work being done through the channels provided by the AMERICAN CERAMIC SOCIETY will be more effective and the returns larger in proportion to the number of plant executives and operators on its roster. This being a mutual SOCIETY in which all have equal responsibilities and benefits there is every reason for enlisting the largest possible number of ceramic workers. It increases the number of contacts through which information is obtained and applied. For this reason the membership committee is vigorously working to increase the number of co-laborers. And because the services rendered through the SOCIETY results in more economical plant practices and better quality of wares the corporations are being asked to help make possible the rendering of this service to and through their plant operators at the smallest possible cost to the operators. This opportunity must be kept within the financial means of the young men in the plants.

PAPERS AND DISCUSSIONS

OBSERVATIONS ON THE EUROPEAN GLASS INDUSTRY[1]

By Henry W. Hess

The conditions of the European glass industry are undergoing rapid changes, in keeping with all other events of these countries. During the last few years, especially last year, the production of German glassware was made on a very cheap basis, and practically stopped English manufacture. In several cases, the jobbers of glassware were themselves stockholders in English companies, and they found it more profitable to discontinue manufacture, and to handle German goods. Of late, this condition has changed somewhat, as German costs are rising, and it has given the English manufacturer a chance to develop his own business. As a result, there is more activity in English glass circles.

In America, the labor problem, and other economic conditions, together with our national custom of large mechanical installations, have developed the production of much machine-made goods. In European countries where labor has been cheap, and at the present time capital for investment is scarce, there has been until recently a slow-down of machine development in the glass industry. Even with this condition existing, the invasion of Europe with American glass machines has started and its march is certain.

The Libbey-Owens Sheet Glass Company has established a plant at Moll near Antwerp, in Belgium, with offices at Brussels. The Company is known as the Compagnie-Internationale pour la Fabrication Mecanique des Vers. This is a most modern plant with by-product coke ovens owned by the same company supplying fuel. The plant will consist of three furnaces and six machines. This glass will be used all over Europe, as Belgium exports, even now, over 90% of its glass products.

In this connection, showing the trend of the times, it is interesting to note that the hand producing window glass companies are financially interested in the mechanical plants. In Spain the new window glass plant near Barcelona, operating two machines, will be of the Libbey-Owens type. In Switzerland, the same type of machine plant, using one machine, is being built.

The O'Neill machine, also built and developed at Toledo, Ohio, with branch plant at London, has over one hundred machines in Europe. These machines have been found very adaptable to European conditions, and with the feeder installation, have met with great favor.

Several other types of bottle machines of American manufacture are also found in England, and on the Continent.

The Owens bottle machine has made its way into England, and also on the Continent, and future developments of this machine are to be expected.

[1] Read before the Glass Division, Pittsburgh Meeting, February, 1923.

The Westlake bulb machine, made by the Libbey Glass Company of Toledo, is now operating in England, and more machines are to be installed. The introduction of this machine on the Continent is certain. Arrangements have been perfected for its installation in Germany, and other installations throughout Europe are planned in the immediate future.

The Danner tube machine, one of the most successful glass machines of recent years is in successful operation in England, and like the Westlake bulb machine, its introduction into Continental Europe is assured.

In addition to the above mentioned, there are other automatic and semi-automatic machines of American make that are finding favor in Europe.

The introduction of these machines into Europe will develop a new line of thought and endeavor in these countries.

In hand manufacture, the personal element helps to overcome many of the varying glass house conditions. Glass of varying temperatures can be controlled by the manipulations of the operator. Bad glass can be skimmed off, imperfections can be cut out by the individual workman, etc. In an automatically operated machine plant, the connecting furnace must have a constant supply of gas, uniform in composition and pressure. The variations in temperature of glass at different stations must be kept within very definite and unvarying limits, and all glass flow must be kept constant, and local deterioration of glass must be carefully avoided. The machine does not discriminate and uses glass as it comes.

These conditions have been fought out in this country and are still being fought. They are now being encountered in the new European installations, and glass house engineers and managers in those countries will do well to recognize the necessary changes. Those who observe them will get production, and those who do not, will blame the new machines.

To illustrate this point, I recall an experience I had with a feeder on a certain machine in Pennsylvania. The bottles produced were poor, and full of white specks, and while occasional runs were made successfully for short periods, the operations were very unsatisfactory. At the same time, the same installation at a nearby city was working very nicely. Examination showed that the operation of the furnace, and floating impurities in the glass caused all the trouble, and not the operation of the machine or feeder. As soon as the tank conditions were improved, the first plant operated as well as the other.

A great many of the troubles and production losses of all types of automatic glass machines may be traced to faulty glass conditions, faulty glass, and in some cases, glass of improper composition for efficient machine use. All of these conditions require a revision of the old type of glass house practice, and the best possible checks on the composition, the relation of temperature to composition, physical properties of the glass, design of the furnace, and many other factors must be considered.

A great many Americans travel abroad in company with their fellow citizens, and make observations and criticisms from our own view point entirely, without considering matters from the economic conditions existing in the countries being visited. In European countries, labor is plentiful, and we notice great labor wastes, with great conservation of building and raw materials, which are not so plentiful. In our own country, this condition is reversed, and the European traveler notices our economy of labor and the introduction of machines, with corresponding wastes in the materials he conserves.

In English glass plants, certain types of workers seem to be skilful, and rank perhaps better than the average American, but in other branches, such as bulb and tube plants, the workers apparently have been developed during war times, and have never acquired the skill of our American workmen.

The fuel problems of England are much the same as our own, and seem to be handled much the same way, and they are using similar grades of fuel. On the Continent, and especially in Germany, very poor fuel is used, and great care is exercised in their fuel installations. In Germany, I understand, they are now using much lignite as fuel in their producers.

Some of the old English plants are extremely interesting, the original plants, built many years ago, are still operated on the same grounds with modern installations, and it is possible to allow one's fancy to dwell on the romance of the glass industry.

The past war has been a great factor in bringing about changes, and before long, the characteristics of individual countries in this industry will gradually disappear. Abroad, they are adopting many of our ideas, and we, in turn, are manufacturing articles formerly made only in Europe, and before long, only slight differences of practice, as necessitated by local conditions, will be apparent.

Toledo, Ohio

THE IMPORTANCE OF FIGURING TAXES INTO COSTS[1]

By F. T. Owens

Introduction

"Why should we figure taxes into costs?" "We propose to pay our taxes out of our profits for this is what we have always done in the past, why should we change in the future?" One answer to this question is, If you are not going to consider taxes as an expense item in your business, how are you going to arrive at a proper selling price? This is the Yankee's plan of answering a question by asking another.

[1] Read before the Heavy Clay Products Division, Pittsburgh Meeting, February, 1923.

It might be interesting to note that today the interest alone on our public debt is upwards of $950,000,000, or approximately $250,000,000 more is paid now for interest than the entire cost of running this Government in 1906 and 1907. Someone must pay the taxes to enable the Government not only to pay its running expenses, but this tremendous item of interest as well. To those of you who have been following this question, a repetition of some figures will not be interesting, but there may be others who have not come in contact with these and I should like to bring out the point in a very splendid talk of James W. Good at the meeting in West Baden in December, in which he stated that the estimated cost for soldier relief alone for next year is $1,715,000,000. He stated further that if the future can be judged by the past that this sum must grow each year for a considerable number of years, for the tendency is to keep in mind the service rendered by our brave and noble soldiers and reward them accordingly as time goes on.

These taxes must be met, and they are collected from manufacturing industries.

Why should we figure them in our costs? I wish to call to your attention the thought that costs are figured for two reasons—the principle one being to make a selling price which will show a return on the capital invested in the business. In making this selling price, we must not only figure our direct costs, which cover items of material, labor, rental, insurance and similar expenses, but we must go a step farther and estimate as nearly as is possible what our taxes for the year are going to be.

If we could tell you today how you could make savings in your plant approximating $2000 to $10,000 per year, you would very likely be making notes that would enable you to put the plans described into effect. Why then should you overlook the thought of sitting down and figuring carefully just where you are going to arrive at the end of the year, provided you have a normal year's business, and in making this calculation figure at the same time the probable amount you will have to pay to your Government. When all this is done, you will be enabled to arrive at a cost basis which will fix a selling price adequate to pay a return on the capital, energy and time spent in the business.

Taxes are going to increase, not decrease. This means that in some lines of business more improved methods must be introduced in order to reduce the burden of cost and, while this burden of direct costs will be reduced, the manufacturer must hand over more and more of his earnings to the Government to help maintain it. In certain kinds of products, there is a limit to the cost that the public will pay and when it reaches a price which the purchasing public thinks too high, substitutes will be used and the business will gradually sink to oblivion.

Obsolescence

I also wish to direct your attention to the important matters of obsolescence and depreciation. There are none but will grant readily that the last five years have seen some wonderful strides made in the heavy clay products manufacture, and the next five years will see even greater changes in methods. I feel sure that the plant that is today up to date in every particular will be practically obsolete ten years hence. If not obsolete by reason of anything else than the cost of producing its material, for labor saving devices will be installed and installed so efficiently that the manufacturer who is not willing to add these to his plant will find himself with a cost so high he cannot demand a fair share of the business.

Depreciation

Sufficient depreciation should be figured on every unit of production to cover replacement when replacement must be made. A number of face brick plants have found that where the average production is 40,000 brick per day, the depreciation cost will run about 55 cents per M brick.

Do not make the fatal mistake of figuring depreciation on production alone, for your kilns will depreciate more rapidly by standing idle through a severe winter than they will if used daily. In figuring depreciation, take the average yearly production and reduce it to a monthly depreciation which will be charged whether the plant is operating or not.

A stabilized market is after all the best market in which to sell goods and if all manufacturers would approach their question of costs in exactly the same manner, then we would find fewer instances of men offering materials at prices way below that which their competitors can manufacture. These differences are not due in many cases to manufacturing methods—they are most often due to inaccurate cost methods.

If one manufacturer is setting out to reap a return of 15% net after all taxes are paid, how can he expect to compete with the man who figures that a 10% gross return is sufficient? How can any ordinary sized business today live on a 10% gross return when the turnover is hardly once in the year's business?

The department store turns over its investment four to six times a year on a 20 to 30% margin. The heavy clay products manufacturers do well if they turn over their investment one and one-half times a year. We are, therefore, entitled, justly so, to a larger return on this turnover than the business which can turn over its investment four to six times per year.

Fiske and Co., Inc.
Watsontown, Pa.

CLASSIFICATION AND SPECIFICATION OF FELDSPAR FOR USE IN VARIOUS INDUSTRIES

By James Turner

Introduction

The following remarks apply only to what I think would be desirable and serviceable for semi-porcelain, vitrified china, white electrical porcelain, white sanitary ware and white vitreous tile, of which I am somewhat familiar. In the other lines of ceramic manufacture I have no experience.

Chemical Composition.—Feldspar with an alkali content of 10% upward can safely be used in a body mix. This would therefore be the range of most feldspar or graphitic granite that is mined, ground, and sold commercially at this time.

The predominant alkali is potash in the ratio of about six to one of soda. However, I know of one good feldspar that has a ratio of about nine of potash to four of soda.

Exception may possibly be taken to the low alkali content given above so in justification will state that Cornwall stone with an alkali content of 6 to 7% has been exclusively used in another country for some generations in the manufacture of the various ceramic bodies that I have before enumerated.

The higher or lower alkali content is replaced by a lower or higher silica content, the alumina showing very little variation. This has been my observation of the analyses of many samples of feldspar.

The analysis should give no more than a trace of iron or other darkening minerals and when fused should be free from specks to any one with good eyesight. To expect an absence of specks when observed through a magnifying glass would place feldspar almost in the class of precious stones and therefore outside the purchasing power of the ceramic manufacturer. Also the production of feldspar to pass such a test would shrink to such small volume that it would have to be given up by the ceramic industry.

Color on Fusion.—Observation has shown that the same ground feldspar fired at different time-temperatures varies a little in shades of whiteness. A high silica and low alkali feldspar will change from a faint lilac tint at cone 7 to a clear white at cone 11. A high alkali and low silica content feldspar will change from the lilac tint at cone 7 to an almost transparent glass at cone 11.

As the range of fire of the various productions is from cone 8 to cone 12 and each manufacturer uses his own kilns to test out the feldspar he purchases, it seems to me that it would be impossible to fix one time-temperature as a standard to be used by all manufacturers.

Fusion Test.—In order to set a standard fusion test it would seem that the temperature, time and "soak" would of necessity have to be first standardized and this is a rather difficult undertaking.

To illustrate, in a small muffle of about ten by eight by six inches, a heat of about cone 11 half over may be developed in about four and one-half hours, giving a certain fusion on a standard sample of ground feldspar. The same result with the same feldspar will be obtained by firing in a round 16-ft. biscuit kiln in about 55 hours with cone 9 bent over. The reason for this is obvious. In addition to this with cone 11 half over in four and a half hours the same muffle kiln in successive firings the same feldspar may not be equally fused for sometimes the body of heat will hang longer in the muffle (after the fuel has been cut off) and therefore, in the vernacular of our business, "soak" whatever is in the muffle. In other words, the maximum heat will stay in the kiln longer one time than another.

This "soak" does not bring the cone down any lower but it will have the same effect on the material as though the heat had been raised an additional cone. This variation takes place in both small muffles and large kilns, so it seems that some additional check would of necessity have to be used to compare by burning the various shipments of feldspar for uniformity of color and fusion.

This can be done and is done by keeping a large standard sample of the feldspar that is being used and is of satisfactory color, fusion, cleanliness and fineness of grind. A small quantity of the standard sample should be put in the kiln with a sample of each new shipment. This comparison when fired even at a slightly higher or lower temperature, should be definite enough to determine whether the quality is reasonably uniform with the standard sample. Of course this is a very simple way, but I have not yet heard of any better method of testing for continuity of uniformity.

There are many manufacturers who prefer a feldspar that has a low alkali content their reason being that at the closing period of the fire (biscuit) they can give a longer soak and obtain the result they desire without so much risk of deformation.

Fineness of Grinding.—As to an arbitrary standard the same difficulty arises as in the standard for alkali content. The various manufacturers have different proportions of the component materials that make up their body. The ground materials (flint and feldspar) cover a range of from 50% to 60% of the bodies. Feldspar runs from 12% to 30% so the range of this material is very great. In vitrified china, there is a small proportion of the highly plastic ball clay used, owing to its detrimental effect on the color as shown in the translucency. Every means is used to obtain plasticity, one of which is the use of a china clay that combines as much as possible, color, plasticity and the strongest tensility, and another means is to use very finely ground flint and feldspar.

Comparatively large quantities of ball clay are used in semi-porcelain and white sanitary ware to obtain sufficient plasticity and strength for

the forming of the pieces of ware. This is especially necessary in sanitary ware owing to the size of the pieces and the strength required for handling in the green state. These large proportions of ball clay aid in vitrification, modifying the feldspar content and a somewhat coarser grind of feldspar would not be detrimental.

As white sanitary biscuit ware is fired at temperatures ranging from cone 8 to cone 11, the content of feldspar varies very considerably in their body composition. Some who fire at cone 8 like a feldspar of high alkali content hence low fusion point, while others use a "harder" feldspar to avoid blistering and to obtain a somewhat wider range of heat at the finish of the firing without detriment to the ware. Whether they use a "hard" or "soft" feldspar they have perforce by experience determined upon a suitable proportion of body materials and a certain temperature-time treatment in the firing of their kilns. These are standard. Whatever kind of feldspar has been found satisfactory, they would naturally desire to receive in continuous uniformity both as to quality and grinding.

The writer has found through a rather long experience in the manufacture of whiteware and in the grinding of feldspar, and a close touch with the desires and requirements of a number of excellent potters (whose excellency is attested by their productions) that a rejection of not more than one per cent on a 160's P. B. Standard lawn is satisfactory to all whiteware manufacturers. I know of one instance where a little more exacting standard is required and this calls for the equivalent of not more than three-quarters of one per cent rejection on a 160's P. B. lawn. On the other hand, manufacturers would be well satisfied if not more than $1^1/_2\%$ is shown on 160's P. B. lawn.

It is very difficult for a grinder who is producing in bulk a product of definite commercial uniformity with the mill and conveying apparatus arranged for the most economical movement of the product, to have various grades of fineness. These could be obtained with very little difficulty from the mills but the segregation in storage would be irksome and take up a great deal of space even if there were only three meshes of fineness.

When a grind of less than 1% on a 180's P. B. lawn has been offered chiefly as a glaze feldspar there has been very little demand for it. The same feldspar at 180's would have a little lower fusing point than at 160's, but when it is put into a glaze composition the whole goes into a cylinder or pan and is ground together for a period of from 20 to 30 hours according to the quantity of the batch, and the hardness of the frit, so that it gets some additional grinding.

A finer grinding might be more desirable where a raw electrical porcelain glaze is being compounded and mixed as this glaze is not so much ground as amalgamated.

Feldspar for Glazes.—For glaze purposes, some manufacturers

desire and insist on a very high potash feldspar with as little soda as possible and are of the opinion that a good glaze cannot be made without it. Others use a combination of two feldspars in the glaze and the finished product is beautiful and the reputation of the ware is excellent. Another potter uses the hardest of feldspars in his glaze obtaining his luster and fusion by increased use of other fluxes. Some potters desire for their glaze a feldspar with a very low fusion point and they get it, but it undoubtedly contains a considerable proportion of soda, though their glazes are good and their ware commercially satisfactory.

Summary

Summarizing, I do not think that a definite specification should be made for the alkali percentage in feldspar. If one were made I think that the great majority of users would ignore it as they would always adopt that which they thought would be best suited to the economy of their manufacture and the quality of their product.

However, I think that a ratio of six of potash to one of soda makes a desirable proportion and can be used in all manufactures.

The feldspar when fused should be free from specks visible to good eyesight.

The fused feldspar should be white drifting toward the warmer cream suffusion rather than a cold bluish white.

When fused its luster should reflect light.

Whatever the alkali content or tone of white it should be reasonably uniform in every shipment and the comparison can be made most surely by a firing test against a satisfactory standard sample. To my mind it is the continuous uniformity of the product that is of most value to the users, and not so much the alkali content.

The standard of grinding which I think would be very satisfactory to manufacturers is not more than 1% rejection on a 160's P. B. Standard lawn. I know so many able manufacturers of semi-porcelain, vitrified china, white electrical porcelain, white sanitary ware and white vitreous tiles who have found this standard suitable for their purposes.

Cook China Company
Trenton, N. J.

DISCUSSION ON "SANDBLAST CASTINGS TO BE ENAMELED"[1]

J. Grainer:—Has anyone had any experience with steel shot?

J. F. Ritter:—We commenced using steel grit in our plant in February, 1923, and we have practically eliminated the dust in our sandblast department.

[1] F. G. Jaeger, *Jour. Amer. Ceram. Soc.*, 6 [9], 976 (1923).

J. E. HANSEN:—I have been using crushed steel sold by the Pittsburgh Crushed Steel Company for the past two years. I could not use the sand because of the dust raised but have obtained good results with steel.

H. F. STALEY:—One of the companies for which I did considerable work has had some experience with crushed steel and shot. For quite a while they used a mixture of two-thirds crushed steel and one-third 30-mesh shot. Some time back they ran into considerable difficulty in that they found a deposit of graphite left on the castings after they had been sand-blasted. Since then they have been using about 35% sand in the mixture with good results. Without the sand they do not get the castings bright and shiny as they want them.

M. E. MANSON:—What is the approximate cost of the sandblast?

F. G. JAEGER:—It requires about 50 h. p. to drive it. It also requires about 10 h. p. for the fan, making 60 h. p. in all. The cost would be about $2500.

We used some steel shot in connection with the sand but we found that if we did not use more force, the sand did not take effect on the ware.

J. GRAINER:—This is of vital importance to any one doing cast iron work. We are having considerable trouble with our wet white. Wet white has not reached that degree of perfection where it will overcome the slightest imperfection. The ware must be scrupulously clean. Would the steel shot polish the ware and get down into the iron? When one piece of ware is left in the blast for a minute, it is apparently clean. It is not clean, however, and the results are unsatisfactory. In justice to different firms that are using wet whites there may be some wet white that gives satisfaction, but the work must be cleaner than in the dry white.

A MEMBER:—In Wisconsin steel shot was used for three years or more. We found that it tears the material more than the sand. Sand apparently is safer and cheaper.

A Workman's Compensation Law in Wisconsin is more drastic than in most other states, which involves another question. There is always more dust in the sandblast room than is considered healthful. If a man stands in a draft and catches a cold, you pay him for his time off. Apparently the day is not far distant when they will absolutely prohibit the use of a room of that character. I understand that some of the other states are contemplating similar laws also.

We have been using a moving table. Only recently I had occasion to check up how much work can be done on that and I found it to be as much as eight thousand pounds in three hours. That is with a LaMotte blast.

F. G. JAEGER:—Did it have any effect in warping the casting?

W. C. LINDEMANN:—Yes. But if you take a piece it may warp on one side only.

A MEMBER:—We did not try the steel shot, but we have tried steel

grip. We have found that it must be dry or it will give trouble. Have you found the same tendency?

F. G. JAEGER:—When it is transported in wet weather it must be covered up to avoid getting wet.

W. C. LINDEMANN:—When we first went into sandblast enameling and for a year or two more we used hydrochloric acid, but sandblasting is far superior to the pickle. The discards on the pickle have dropped as much as 20 to 30%.

F. G. JAEGER:—We had some experience with another company, and we had the same trouble Mr. Lindemann described in the warping.

L. D. BRIDGE:—How much sand for a pound of casting is used? More specifically on a stove plate casting?

F. G. JAEGER:—That depends somewhat on the size of the castings. It would average about four thousand pounds of casting in eight hours, and we would use about one thousand to fifteen hundred pounds of sand. It also depends on the operator. If he is a good workman, you can get the average amount or better, and perhaps save on the sand.

B. T. SWEELY (Chairman):—Mr. Lindemann, is there a bill introduced in your state in regard to spraying?

W. C. LINDEMANN:—There was a bill before the legislature two years ago prohibiting spray guns. That would prohibit the use of spray guns in any work that might be objectionable to the health. It is again before the Legislature, and there is considerable propaganda out. The manufacturers are endeavoring to show that it is not injurious to the health. I understand that it is being brought up by the painters in the Chicago, Milwaukee and St. Paul workshops, who are strongly unionized, together with the American Federation of Labor.

CHAIRMAN:—It is started by the unions in a short-sighted policy in opposition to labor saving devices. The same bill is up before the California legislature.

E. HOGENSEN:—Some of this trouble is due to improper fans being used. Oftentimes the manufacturers themselves are to blame for not using larger fans.

B. T. SWEELY (Chairman):—Do you know how far this legislation has gone?

E. HOGENSEN:—Only in California and our neighboring states.

CHAIRMAN:—It would be of considerable interest to the Division to know. If this thing is going to be acute, we shall have a great deal of trouble on our hands. On most of the flat work, spraying has come to be almost the universal method of applying the enamel.

DISCUSSION ON "SUBSTITUTING OIL FOR PRODUCER GAS"[1]

W. W. OAKLEY:—Will you give us the cost of the oil per gallon; also whether they tried any sheet flame burners?

F. S. THOMPSON:—The price of the oil was $4\frac{1}{2}$ cents in the car on our siding. We did not use sheet flame burners. The plant under discussion is located in New England.

J. C. HOSTETTER (Chairman):—Oil is somewhat cheaper there due to the fact that it is brought in by boat; perhaps Texas or Mexican oil is used. The glass pull is 15 or 16 tons, is it not?

F. S. THOMPSON:—Yes, the tonnage pull is approximately 16 tons. The designed capacity is 20 tons.

A MEMBER:—How about the pressure necessary on that burner in order to get flame? Is it necessary to use excessive pressure?

F. S. THOMPSON:—At the start we used air at 60 pounds, afterwards steam under 100 pounds at the boiler and 70 pounds at the burner.

CHAIRMAN:—This oil is cheaper than we get it in Corning.

G. AURIEN:—What is the gravity of the oil?

F. S. THOMPSON:—18 to 20. The price of coal is $9.50. At that time it was about $8.00 delivered in New York.

Mr. Milford cited an instance where heavy Mexican crude oil was used to heat a recuperative furnace. The burners were located at the rear of the furnace and the charging took place at the side. The oil was fed to the burners under considerable pressure with the result that the flame extended about two-thirds of the distance of the melting chamber of the tank.

Whenever the tank was charged with new batch the dusty portion would be swept along by the flame and would be deposited in the recuperator passages with any condensed volatile products.

An examination was made of some of the fused material taken from the recuperator passages and it was found to contain large percentages of soda ash, lime and sulphur compounds. It also showed about 5% arsenic.

Mr. Milford stated that the oil worked satisfactorily in a recuperative furnace.

G. AURIEN:—I came particularly to get information. We have all had some little experience in burning oil. The question arises in my mind as to whether or not a heavy gravity oil in a narrow furnace, say 16 feet in width, would be more expensive or less on account of combustion or non-combustion, compared to 30 gravity oil. It has been our experience that the heavy gravity oil takes longer to form complete combustion resulting in a waste. I would like to hear an expression of opinion from

[1] F. S. Thompson, *Jour. Amer. Ceram. Soc.*, 6 [10], 1050 (1923).

someone who has had the same kind of an experience, whether a lighter oil would be more beneficial than a heavy one in a narrow furnace.

CHAIRMAN:—We have a large number of combustion engineers with us.

J. F. Greene explained that at about the time the coal strike came along they had a furnace built with a recuperator and a high pressure oil system was installed whereby oil was atomized at one side, at the back of the furnace and the exhaust flue was on the other side, giving them a horse-shoe flame.

On installing this system we were advised to use a Pennsylvania residuum oil of about 32° Baumé. The oil system company stated that the best results were obtained with this oil.

We were making a rather hard glass in this furnace and to keep the boots hot were obliged to force the fire well down into the nose. We found it impossible to get clean glass in the boots, even with this high grade light oil. Standard oil of the same gravity was no worse and no better than the pure Pennsylvania oil. The primary and recuperator air supplies were varied systematically in the attempt to find good working conditions. Flue gas analyses showed practically no CO with varying amounts of CO_2 and excess oxygen. But the deposition of carbon on the glass continued.

Later we made a softer glass in this tank with complete success. In this case we used more stack and were able to keep the fire away from the boots.

The dirtying of the glass was due, evidently, to a deposition of carbon during the passage of the flame through the furnace, and occurred in spite of sufficient air supply, good mixing, and a light clean fuel oil. The successful application of fuel oil to a glass melting furnace, especially for the manufacture of high grade ware, requires that the glass, the furnace, and the oil system be chosen so as to work well together. Each one of these three elements must be considered in its relations to the other two.

CHAIRMAN:—Was the oil pre-heated?

J. F. GREENE:—Yes, at the central pump house, and supplied to the burner at a little over 100°F.

DISCUSSION ON "PRODUCER GAS FOR BURNING REFRACTORIES"[1]

A. F. GREAVES-WALKER:—The refractories manufacturers at the present are much interested in the development of the railroad tunnel kiln for the burning of refractories. There seems to be a question in the minds of those interested as to the value of producer gas and one of the things that is worrying them is the question of firing at high temperatures. We can safely

[1] W. D. Richardson, *Jour. Amer. Ceram. Soc.*, **6** [7], 799 (1923).

profit by the experience of the European refractories manufacturers. The American Refractories Company is operating a kiln in Austria burning 50 tons of magnesite a day with brown coal producer gas. They are getting cone 20 continuously without any difficulty. Dr. Otto and Company of Dahleisen, Bendorf, Germany, are operating four kilns producing 40 thousand silica brick per day in each kiln and getting cone 14, using high volatile coal from the Lower Ruhr district. I think if there is any question about adaptability of producer gas, those examples should prove that there is no ground for it.

P. H. DRESSLER:—We have used producer gas to a large extent and can state that there is no trouble at all in reaching high temperatures, provided you have preheated air.

In regard to one of the points Mr. Richardson made concerning the use of steam in producers, I think, as a rule, it is found that where the gas is used very close to the producer there is every advantage in using the least volume of steam. Where the producer is quite a long way from the point of application of the gas and there is much cooling in the ducts, it is advantageous to use more steam and make a gas with a higher hydrogen content and a lower sensible heat. In this way more B.t.u.'s are delivered to the furnace. I believe it is considered by most of the producer gas experts that the sooting of the ducts is very largely due to the decomposition of the carbon monoxide into carbon dioxide and carbon which takes place at a low red heat. This is a reversal of the reaction which takes place at higher temperatures in the producer itself where carbon dioxide reacts with carbon to give carbon monoxide. There is, therefore, an advantage in making a fairly cool gas since this cuts down the sooting of the ducts. Where very hot gas is used, as for instance is common in the steel mills, the ducts clog up very rapidly.

MR. NORTHEY:—Mr. Richardson spoke of the compartment kiln as being more serviceable for burning the different sizes of material than the car tunnel kiln. In the compartment kiln, all compartments would burn practically the same. Just in which way will the compartment kiln accomplish this to better advantage than the tunnel kiln?

W. D. RICHARDSON:—Each chamber of a compartment kiln is fired independently, so that more time can be taken with any compartment and the finishing temperature may be higher or lower in one compartment than in another. In a tunnel kiln to make such variations in time and temperature interferes more or less with its operation, and the best results are obtained when the cars are all set in the same manner, with the same size of ware, and the speed of the cars through the tunnel is uniform. Moreover, the cooling of the ware in a tunnel kiln is necessarily rapid for economical operation while large bodies should be cooled more slowly than small ones. So I have said that the compartment kiln has greater flexibility.

You can burn any kind of clay product in it and give any compartment such time and temperature as may be required without detriment to operations in other compartments.

D. W. Ross:—Can you readily burn in your compartment kiln one chamber at cone 1, 2 or 4 and the next chamber at cone 10?

W. D. Richardson:—Yes.

D. W. Ross:—Without any special loss of heat?

W. D. Richardson:—Yes.

C. E. Bales:—I would like to ask the opinion of Mr. Richardson of the use of producer gas in round, down-draft periodic kilns.

W. D. Richardson:—Producer gas is being burned successfully in periodic kilns, where only moderate temperatures are required. Just how high temperature can be practically attained, using air at atmospheric temperatures, I do not know, but certainly not high enough for refractories. It would be practical, in some cases, to preheat the air for combustion with the heat of cooling or burning kilns and attain somewhat higher temperatures but the results would not be satisfactory in the fire brick industry.

Referring once more to the point of comparison between the tunnel kiln and the compartment kiln for firing shapes, Mr. Richardson pointed out, and the point was well taken, that it was possible to a certain extent to separate the small and large shapes in a compartment kiln, thus preventing the loss of production due to the slow firing required for large shapes. Most of the large shapes I have seen in a brickyard are not capable of being piled up to any height in a compartment kiln. They can only be set in the upper courses. That being so, this argument somewhat loses its force. Furthermore, it appears to me that whether the small and large shapes are set separately in different compartments or together in the same compartment, it makes no difference to the production of the kiln since if one compartment takes longer to fire off than usual this prevents the next compartment from being finished, it not being possible to have two compartments on full fire simultaneously. In this respect the compartment kiln is in exactly the same position as the tunnel kiln where if you have to hold some material longer in the heat zone it naturally delays the operation.

D. W. Ross:—I do not know whether that applies particularly to the problem in hand. The refractories of the glass industry are about as irregular as any clay shapes there are. They will normally pile about three high, thus filling the ordinary rectangular kiln to near its crown. It appears probable that such shapes would pile conveniently in the filling of the compartments.

MEMORANDUM ON POWER SITUATION IN THE UNITED STATES IN MILLION HORSEPOWER

By S. S. Wyer

The diagram (Fig. 1) shows the power situation in the United States in million horsepower. The diagram at the left shows that the present de-

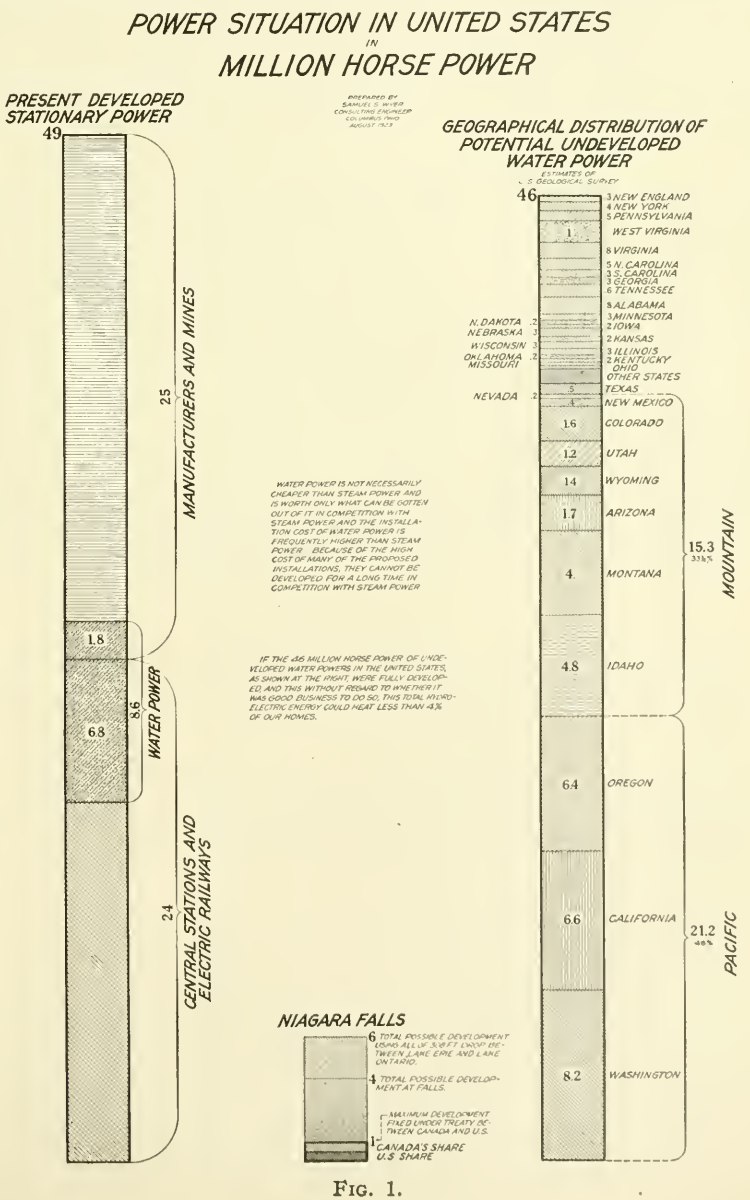
POWER SITUATION IN UNITED STATES
IN
MILLION HORSE POWER
PRESENT DEVELOPED STATIONARY POWER
49
25
MANUFACTURERS AND MINES
1.8
8.6
6.8
WATER POWER
24
CENTRAL STATIONS AND ELECTRIC RAILWAYS
PREPARED BY SAMUEL S. WYER CONSULTING ENGINEER COLUMBUS OHIO AUGUST 1913
GEOGRAPHICAL DISTRIBUTION OF POTENTIAL UNDEVELOPED WATER POWER
ESTIMATES OF U.S. GEOLOGICAL SURVEY
46
3 NEW ENGLAND
3 NEW YORK
5 PENNSYLVANIA
1 WEST VIRGINIA
8 VIRGINIA
5 N. CAROLINA
3 S. CAROLINA
3 GEORGIA
6 TENNESSEE
3 ALABAMA
3 MINNESOTA
2 IOWA
2 KANSAS
3 ILLINOIS
2 KENTUCKY
OHIO
OTHER STATES
N. DAKOTA .2
NEBRASKA .3
WISCONSIN .3
OKLAHOMA .2
MISSOURI
TEXAS
NEVADA .2
NEW MEXICO
1.6 COLORADO
1.2 UTAH
1.4 WYOMING
1.7 ARIZONA
4 MONTANA
15.3 33⅓%
MOUNTAIN
4.8 IDAHO
6.4 OREGON
6.6 CALIFORNIA
8.2 WASHINGTON
21.2 46%
PACIFIC
WATER POWER IS NOT NECESSARILY CHEAPER THAN STEAM POWER AND IS WORTH ONLY WHAT CAN BE GOTTEN OUT OF IT IN COMPETITION WITH STEAM POWER AND THE INSTALLATION COST OF WATER POWER IS FREQUENTLY HIGHER THAN STEAM POWER. BECAUSE OF THE HIGH COST OF MANY OF THE PROPOSED INSTALLATIONS, THEY CANNOT BE DEVELOPED FOR A LONG TIME IN COMPETITION WITH STEAM POWER
IF THE 46 MILLION HORSE POWER OF UNDEVELOPED WATER POWERS IN THE UNITED STATES, AS SHOWN AT THE RIGHT, WERE FULLY DEVELOPED AND THIS WITHOUT REGARD TO WHETHER IT WAS GOOD BUSINESS TO DO SO, THIS TOTAL HYDRO-ELECTRIC ENERGY COULD HEAT LESS THAN 4% OF OUR HOMES.
NIAGARA FALLS
6 TOTAL POSSIBLE DEVELOPMENT USING ALL OF 36 FT. DROP BETWEEN LAKE ERIE AND LAKE ONTARIO.
4 TOTAL POSSIBLE DEVELOPMENT AT FALLS.
MAXIMUM DEVELOPMENT FIXED UNDER TREATY BETWEEN CANADA AND U.S.
1 CANADA'S SHARE
U.S. SHARE

Fig. 1.

veloped stationary power is, in round numbers, 49 million. Of this total developed stationary power, 6.8 million water power is used in central stations and electric railways and 1.8 million water power is used in manufacturing plants and mines.

The diagram at the right, shows that there is 46 million horsepower of undeveloped water power in the United States and the vertical classification shows the geographical distribution. An interesting notation here is that 46% of the 46 million horsepower, or 21.2 million, is in the three Pacific Coast states, while 33%, or 15.3 million, is in the Rocky Mountain states.

If this entire 46 million horsepower of undeveloped water power in the United States were fully developed, and this without regard to whether it was good business to do so, the total hydro-electric energy could heat less than 4% of our homes.

The insignificance of Niagara Falls in relation to the total power situation is shown in the middle. If all of the flow of the Niagara River and the total head between Lakes Erie and Ontario were used, 6 million horsepower could be developed. If the head at the Falls alone was used, without using the drop in the whirl pool and rapids below, 4 million horsepower could be developed.

The treaty between the United States and Canada limits the total development to one million and out of this the United States' share is 400 thousand horsepower and Canada's 600 thousand horsepower.

ACTIVITIES OF THE SOCIETY

PRESIDENT'S PAGE

The entire Society is to be congratulated on the fact that during the past eleven months a larger number have joined the Society than during any previous twelve months. The number of withdrawals is less than last year. This bespeaks a heartening growth in appreciation of the value of this coöperative enterprise. To the Membership Committee is due especial praise for their effective plans laid for presentation of the opportunities of membership, but the solid worth of the Society in things accomplished is the basic reason for this substantial increase. While the increase in the Society's roster is evidence of essential work well done by the Membership Committee the greater reason for congratulation lies in the recognition they thus obtained for the real service being rendered.

It is my hope that the members will continue without abatement their presentation of the opportunities and benefits of membership in the Society. Only if this is done will the next budget committee feel justified in carrying on the present program, and it is impossible to think of failure after going so far.

* * *

The report of the Nominating Committee insures the Society of a strong and progressive board next year. Great things may be expected of them.

* * *

Georgia Tech is about to begin work on its new ceramic school. The legislature has appropriated $20,000, the ceramic interests of Georgia and the South $20,000, the Atlanta *Constitution* $8000, and the land on which the school is to be built has been donated. This is a splendid start for the new enterprise and speaks well for the clay-workers of Georgia, who have worked so hard to esatblish this, the first ceramic school below the Mason and Dixon Line.

* * *

The Committee on Papers and Program have outlined a splendid program for the Atlantic City meeting, but it will be necessary for every member to do his share to make it a success. The call for papers has gone out, and the officers hope for a generous response.

* * *

Application for a Section Charter has been made by the Society's members on the Pacific Coast. There is no doubt that this Section will fill a great need on the Coast, the members being so far removed from the center of the Society's activities in the East. The officers and members of the Society extend best wishes for success to the new Section.

NOMINATION FOR OFFICERS AND TRUSTEES FOR 1924

Persons placed in nomination by the nominating committee for officers and the nominees for Division representative on Board of Trustees are as follows:

President—Robert D. Landrum, Cleveland, Ohio.

Vice-President—Raymond M. Howe, Pittsburgh, Pa.

Treasurer—H. B. Henderson, Columbus, Ohio.

Trustees—

Art Division (1 year)—F. H. Rhead, Zanesville, Ohio

Enamel (1 year)—R. R. Danielson, Washington, D C.

Refractories (1 year)—J. S. McDowell, Pittsburgh, Pa.
Glass (2 years)—J. C. Hostetter, Corning, N. Y.
White Wares (2 years)—C. C. Treischel, Pittsfield, Mass.
Heavy Clay (3 years)—C. Forrest Tefft, Watsontown, Pa.
Terra Cotta (3 years)—R. L. Clare, Woodbridge, N. J.

Article V, 2. "Any ten Active Members may constitute a self-appointed Nominating Committee and present names of nominees for President, Vice-President, and Treasurer to the Secretary for placement on the election ballot, provided such names are presented at least thirty days before the annual meeting."

In case of failure of election the Board of Trustees will at the time of the annual convention make appointments to fill the vacancies as provided for in Article IV, paragraph 12 of the Constitution.

All of the above-named nominees have accepted the nomination.

THE SOCIETY MAY BE GLORIFIED IN ITS GOOD WORK, BUT IT NEEDS OPPORTUNITY AND SUPPORT

Last June note was made of the fact that the membership had that month passed the 2000 mark. The 2200 mark was passed this month. Mention of this is only in passing for in fact it is only "in passing." The SOCIETY is on the way to obtaining that strength which the magnitude and character of the ceramic industries demand.

That the work which the SOCIETY is doing is being appreciated more and more is shown in the following data. These data, however, tell more than appreciation, they speak loud in terms of expectation. More members and greater facilities bring larger opportunities and greater obligations, and it is just these that the members of the SOCIETY are on their toes to meet to the full. Here is the record to date.

				Gain		
	Personal	Corporation	Total	Personal	Corp.	Total
January, 1922	1350	139	1489			
January, 1923	1611	216	1827	261	77	338
November, 1923	1930	284	2214	319	68	387

The net gain in members during the month of October 15 to November 15 was 68 personals, 30 corporations. There is one more month remaining in 1923 to make the record of corporation additions exceed the 1922 record of 77 new members. Rather than 68, the total corporation additions for 1923 should be 200. This is possible if every member does his share, thus increasing the opportunities for more effective promotion of the Ceramic Arts and Sciences.

NEW MEMBERS RECEIVED FROM OCTOBER 15 TO NOVEMBER 15

PERSONAL

Robert Ahrens, 850 E. 5th St., St. Paul, Minn., Foreman of Porcelain Division, Seeger Refrigerator Company. (Reinstated.)

Robert J. Anderson, U. S. Bureau of Mines, Pittsburgh, Pa., Metallurgical Engineer.

Yngve R. Anderson, University of Saskatchewan, Saskatoon, Sask., Canada, Student Member.

Stanley Aronson, 5043 Franklin Ave., Los Angeles, Calif., Electric Furnace Dept., Research Lab., Vitrefax Co.

B. C. Berg, 5332 Santa Fe, Los Angeles, Calif., President Schurs, Oil Burner Company.

M. E. Blackburn, 18th and Union Sts., Bellaire, Ohio.

G. Ray Boggs, 612 Pacific Mutual Bldg., Los Angeles, Calif., Manager, American Clay Company and American Grinding Company.

Carl D. Bossert, 66 S. Third St., Columbus, Ohio, Civil Engineer.

Paul C. Boving, Pomona, Calif., Manager Pomona Tile Mfg. Company.

Wray G. Brady, 600 American Bank Bldg., Los Angeles, Calif., Secretary, Pacific Clay Products, Inc.

Oscar Brewer, 4901 Stenton Ave., Philadelphia, Pa., Sales Engineer, Leeds & Northrup Company.

Judson F. Clark, 285 W. Mountain St., Pasadena, Calif., President and Treasurer, Pomona Tile Mfg. Company.

Holt Condon, 189 S. Michigan Ave., Pasadena, Calif., Ceramic Engineer, Batchelder Wilson Company.

W. H. Cook, 608 Angeleno Ave., Burbank, Calif., Supt., Empire China Co.

W. S. Cook, Virginia Apartments, Parkersburg, W. Va., General Porcelain Company.

J. R. Crouch, c/o Pittsburgh Plate Glass Company, Charleroi, Pa., Assistant Superintendent.

Phillip H. Cruikshank, c/o H. Mueller Mfg. Company, Decatur, Ill.

E. M. Davids, Tropico Potteries, Glendale, Calif., Secretary.

J. L. Davis, 143 N. Daly St., Los Angeles, Calif., Superintendent, Pacific Clay Products, Inc.

Herbert R. Dickey, University of Saskatchewan, Saskatoon, Sask., Canada, Student Member.

Leon A. Dougherty, 1045 Fourth Ave., Astoria, N. Y., Ceramist, N. Y., Architectural & Terra Cotta Company.

Finlay M. Drummond, Jonathan Club, Los Angeles, Calif., Vice-President and General Manager, Alberhill Coal & Clay Company.

Robert W. Ellison, 112 N. Alta Vista, Monrovia, Calif., Chemist, The Vitrefax Co.

Stewart Findley, Los Angeles, Calif., Manager, Emsco Clay Co.

William J. Geddes, 611 Interstate Trust Bldg., Denver, Colo., Superintendent, Denver Sewer Pipe & Clay Company.

Karl Hart, 111 N. Rugby Ave., Huntington Park, Calif., Maintenance Supt., The Vitrefax Co.

Grant O. Herb, 2819 13th St., Washington, D. C., Junior Ceram. Engr., Bur. of Standards.

C. A. Hoppin, 607 Central National Bank Bldg., Peoria, Ill., President, C. A. Hoppin and Company.

F. T. Houlahan, 3700 9th Ave., S. Seattle, Wash., President, Brick and Tile Mfg. Company.

Henrietta O. Jones, St. Louis School of Fine Arts, Washington University, St. Louis, Mo.

Julius A. Kayser, 4943 Lansdowne Ave., St. Louis, Mo., Assistant Ceramist, Laclede-Christy Clay Products Corporation.

Henry Frank Lee, 2421 E. 55th St., Los Angeles, Calif., Ass't Supt. Production, The Vitrefax Co.

Wager Lewis, Cranberry Creek, N. Y., Superintendent, Gloversville Feldspar Company.

Daniel C. Lindsay, Bureau of Standards, Washington, D. C., Ceramic Division.

Robert Linton, 600 American Bank Bldg., Los Angeles, Calif., General Manager, Pacific Clay Products, Inc.

Cecil V. McClintock, Whittier, Calif., Route No. 2, Box 227, Pacific Clay Products, Inc., Plant 6.

Earl McClintock, 4556 N. Griffin Ave., Los Angeles, Calif.

William McClintock, 215 East Ave., 41, Los Angeles, Calif., Superintendent, Pacific Clay Products, Inc.

Al. J. Mesmer, Superintendent, St. Louis Fire Brick & Clay Company.

Frederick A. Moffat, Moffats Ltd., Weston, Ontario, Canada, General Manager and Treasurer.

Thomas A. O'Shaughnessy, 4705 N. Winchester Ave., Chicago, Ill., Color Dept., N. W. Terra Cotta Company.

Campbell Patch, Haws Refractories Company, Johnstown, Pa., Secretary and Treasurer.

Charles W. Peddrick, Jr., 170 Broadway, New York, N. Y., Genefal Manager, Gloversville Feldspar Company.

W. H. Pelletier, 2226 Dennison Ave., Cleveland, Ohio, Chemist, Ferro Enameling Company.

Walter A. Preische, Alfred, N. Y. (Student Member).

Edward Reynolds, Santa Barbara, Calif., Manager, Unit Brick and Tile Company.

Robert Roadhouse, 49 Wooster St., Norwalk, Ohio, Enameler.

Rhoda L. Robbins, 229 Market St., Bloomsburg, Pa., Potter.

H. A. Rossell, Box 414, Bristol, Tenn., Mill Manager, Mineral Products Company.

Ichiro Shimada, Ebie Wishinarigun, Osaka, Japan, Glass Manufacturer.

J. F. Sinclair, c/o Jeffery-Dewitt Insulator Company, Kenova, W. Va., General Manager.

Krishen Singh, Katni Cement Factory, P. O., C. P. India.

James V. Slade, 38 S. Dearborn St., Chicago, Illinois, Chicago Manager, Dorr Co., Inc., Engrs.

Fred O. Slasor, 4419 S. Normandie Ave., Los Angeles, Calif., Superintendent, American Encaustic Tiling Company, West Coast Plant.

F. W. Spring, Metters, Ltd., Mitchell Road, Alexandria, Sidney, P. S. W., Australia, Enameler.

Walter G. de Steiguer, 1314 Bank St., S. Pasadena, Calif., Tropico Potteries, Inc., Superintendent, Tile Department.

Roger H. Stitt, 137 Hyland Ave., Ames, Iowa, Student.

G. C. Stoll, 211 Higgins Bldg., Los Angeles, Calif.

Justin C. Sturm, 76 E. Walton Place, Chicago, Ill., Inland Glass Company.

Arthur P. Taylor, 706 Burns St., Cincinnati, Ohio, Secretary and Treasurer, The Chas. Taylor Sons Company.

Clifford Tillotson, Route No. 2, Box 938, Los Angeles, Calif., Manager, Atlas Fire Brick Company.

Howard Webster, 702 Harrison Bldg., Philadelphia, Pa., Consulting Engineer.

Arch T. Weisgerber, Box 353, Alliance, Ohio, Production Manager, Crescent China Company.

Hugh E. Weightman, 608 S. Dearborn St., Chicago, Ill., Director, Research Division, Mophite Company.

A. H. C. Wenger, Messrs. Wenger, Ltd., Etruria, Stoke-on-Trent, England.

G. A. Wild, 605 Lankenlim Bldg., Los Angeles, Calif., President, Western Brick Company.

A. T. Wintersgill, 411 N. Louis St., Glendale, Calif., Salesman, Pacific Clay Products Co., Inc.

John Frederick Wynn, Beech Creek, Pa., Supt., General Refractories Company.

Corporations

American Lava Corporation, Electric Insulation, Chattanooga, Tenn. John Krusei, President.

The Atlas China Co., Mfgrs. of Semi-porcelain, Niles, Ohio. A. O. C. Ahundts, President and Treasurer.

Ball Brothers Co., Glass Mfgrs., Muncie, Ind., George A. Ball, Treas.

The Beach Enameling Co., Enameled Signs, Coshocton, Ohio.

Challenge Refrigerator Co., Grand Haven, Mich., E. O. Harbeck.

Columbian Enameling and Stamping Co., Mfrgs. of Enameled Ware, Terre Haute, Ind. Werner H. Grabbe.

Detroit Star Grinding Wheel Co., 111 Cavalry Ave., Detroit, Mich. Frank H. Whelden, Secy. & Treas.

The Dolomite Products Co., Producers of Dolomite Refractories, 1110 Euclid Ave., Cleveland, Ohio. H. P. Gells, Jr., Pres. and Gen. Mgr.

Findlay Clay Pot Co., Washington, Pa.

Florida China Clay Co., Producers of Florida China Clay, Box 83, Leesburg, Fla. L. A. Morris, Secy. & Treas.

Friderichsen Floor & Wall Tile Co., 215 E. Kansas St., Independence, Mo.

William J. Geddes, Denver Sewer Pipe & Clay Co., 611 Interstate Trust Bldg., Denver, Colo.

Gill Clay Pot Co., Mfgrs. Clay Pots and Tank Blocks, Muncie, Ind. Charles O. Grafton.

Jeffery-Dewitt Insulator Co., Kenova, W. Va. J. F. Sinclair, Gen. Mgr.

Kohler Co., Enameled Plumbing Fixtures, Kohler, Wis. Walter J. Kohler, Pres.

Lapp Insulator Co., Inc., Electrical Porcelain, Leroy, N. Y. G. W. Lapp.

Metropolitan Paving Brick Co., Mfgrs. paving brick, common brick and hollow tile, Canton, Ohio. R. B. Keplinger, Asst. Gen. Mgr.

Missouri Fire Brick Co., 418 Security Bldg., St. Louis, Mo.

Mitchell-Bissell Co., 334 Fourth Ave., New York City. John A. Williams, Asst. Secy.

New Jersey Pulverizing Co., 15 Park Row, New York City. Harry F. Spier, Pres.

New Jersey Terra Cotta Co., Mfgrs. of Terra Cotta, Singer Bldg., New York City. E. V. Eskesen, Pres.

The Northwestern Terra Cotta Co., Mfgrs. of Architectural Terra Cotta, 2525 Clybourne Ave., Chicago, Ill. A. F. Hottinger.

J. M. Seasholtz, Porcelain Enameling, Front and Spruce St., Reading, Pa.

The A. A. Simonds-Dayton Co., Grinding Wheel Mfgrs., N. Summit St. and Negley Place, Dayton, Ohio, Frank R. Henry, Secy.

Simplex Engineering Co., Washington Trust Bldg., Washington, Pa. C. E. Frazier, Pres.

United States Gauge Co., Sellersville, Pa. W. H. Lentz.

United Clay Mines Corp., Trenton, N. J. C. C. Engle, Gen. Sales Mgr.

The Vitrefax Co., Refractories, 51st & Pacific Blvd., Los Angeles, Calif.

Wishnick Tumpeer Chemical Co., Importers and Dealers in Chemicals, Oils, Colors, 365 E. Illinois St., Chicago, Ill. Michael Agazim.

Waltham Grinding Wheel Co., Waltham, Mass. M. F. Cunningham, Gen. Mgr.

Membership Workers' Record

Name	Personal	Corporation	Name	Personal	Corporation
Alice A. Ayars	1		John M. Dell		1
L. L. Beeker	1	1	Frederick W. Donahoe	1	
George Brian		1	B. K. Eskesen		1
E. N. Bunting	1		Geo. P. Fackt	1	1
Paul E. Cox	1		F. C. Flint		3
R. R. Danielson	2		H. C. Goodwin		1
H. E. Davis	1	2	Roland W. Gouin	1	

Name	Personal	Corporation	Name	Personal	Corporation
F. M. Hartford	1		A. R. Payne	1	
T. D. Hartshorn	1		F. H. Riddle		2
John Herzog	1		W. S. Roberts		1
L. C. Hewitt	1		John Sawyer	8	
Frank Humpel		1	Homer F. Staley	1	
E. C. Hunting	1		Gail R. Truman	2	
E. L. Hutchinson	1		Gus M. Tucker	1	
Herbert Goodwin	1		Karl Turk	1	1
R. M. King		1	W. E. S. Turner	1	
W. M. Jacobs	1		W. F. Wenning	1	
A. A. Klein	1		Otto W. Will	1	
H. J. Knollman	4		Hewitt Wilson	1	
Paul S. MacMichael	1		W. G. Worcester	2	
Werner Malsch	1		R. C. Zehm	1	
Ellsworth Ogden	1		A. S. Zopfi		1
Fred Ortman	8	1	Office	11	1
W. G. Owen	1			—	—
C. W. Parmelee	1			68	30

PERSONAL ACTIVITIES OF SOCIETY MEMBERS

Roy C. Brett has moved from 1697 Lee Road to 1545 Parkhill, Cleveland, Ohio.

John Campbell who has been employed with the Asbestos Wood Co., Nashua, New Hampshire has moved to Canada where he is located with the Abitibi Power and Paper Co., Iroquois Falls, Ontario.

F. F. Carhart is living at 727 Forty-first street, Des Moines, Ia., having moved from Sheffield, Iowa recently.

Sandford S. Cole, formerly instructor in the department of Ceramics, at the University of Illinois has moved to Pittsburgh, Pa., where he is located in the Koppers Laboratory, Mellon Institute.

Herman L. Cook is now located at Stevens Brothers and Co., Stevens Pottery, Ga. Mr. Cook formerly lived in Danville, Ill.

James A. Davies who has been filed among "members lost" lives at Parkwood Drive, Cleveland, Ohio.

J. A. De Celle has moved from Waukegan, Ill., to 131 N. Sheridan Road, Highland Park, Ill.

Redfield Dinwiddie recently of Somerville, N. J. has removed to 213 W. 21st street, New York City.

Bert De Witt formerly of the Belmont Stamping and Enameling Co., New Philadelphia, Ohio, is now with Genderp-Paeschke and Frey of Milwaukee, Wis.

W. Russell Greer gives 612 Hollen Road, Baltimore, Md., as his correct address.

F. P. Hall who has been with the Bureau of Standards, Washington, D. C., has moved to 884 Massachusetts Ave., Cambridge, Mass. Mr. Hall is taking graduate work in the department of Physical Chemistry, Massachusetts Institute of Technology.

Herman A. Hall, formerly of Medina, Ohio, is now with the Graham Clay Products Co., Conneaut, Ohio.

John H. Kennedy has moved from Canandaigua, N. Y., to 243 Pulteny St., Geneva, N. Y. Mr. Kennedy is employed with the Lisk Manufacturing Co., Ltd.

S. Spicer Kenyon has removed from 2214 15th street to 2490 Pierce Ave., Niagara Falls, N. Y.

Harry J. Knollman writes that his new address is 1210 W. 28th street, Los Angeles, Calif.

F. M. Koenig, manager of the Schoonhoven Pottery, Schoonhoven, Holland notified the Secretary's office that his address is Bergen street, Brooklyn, N. Y.

James W. Moncrieff of Stockton, Calif., is living at 1215 Pine street.

William E. Rice of Alliance, Ohio, is employed with the U. S. Bureau of Mines, 4800 Forbes street, Pittsburgh, Pa.

Fred Sauereisen of the Technical Products Co., has been transferred from East Liverpool, Ohio to the Pittsburgh Office, 116 South Sheridan Ave.

H. H. Stephenson, formerly of Montreal, Canada has accepted a position with the American Encaustic Tiling Co., Zanesville, Ohio.

Lawrence A. Vincent has moved from Zanesville, Ohio to New Castle, Pa.

R. T. Watkins is living at 1410 W. University Ave., Urbana, Ill. Mr. Watkins is an instructor in the Department of Ceramics, University of Illinois.

Glen D. Williams has moved from Waukegan, Illinois to Worcester, Mass.

William A. Yung has moved from Harrison, N. J. to Pittsburgh, Pa. where he is employed with the Macbeth-Evans Glass Co.

NEW ENGLAND SECTION FALL MEETING

By C. H. Lawson[1]

The Fall Meeting of the New England Section of the American Ceramic Society was held at the Boston City Club on Saturday Evening, October 27th at 7 o'clock P.M. with the following members present:

William Pettignew, The Norton Co., Worcester, Mass.
Albert S. Adcock, The Norton Co., Worcester, Mass.
C. A. Underwood, Queen's Run Refractories Co., Boston, Mass.
W. A. Robertson, Dedham Pottery, East Dedham, Mass.
Glenn D. Williams, The Norton Company, Worcester, Mass.
L. B. Bassett, Baxter D. Whitney & Sons, Inc., Winchendon, Mass.
A. C. Postley, The River Feldspar & Milling Co., Middletown, Conn.
J. M. Grafton, Boston Pottery Company, Boston, Mass.
S. H. Slobodken, Boston Pottery Company, Boston, Mass.
E. D. May, Baxter D. Whitney & Son, Inc., Winchendon, Mass.
Arthur T. Malm, The Norton Company, Worcester, Mass.
C. B. Tilton, Cortland Grinding Wheel Corp., Chester, Mass.
A. A. Klein, The Norton Company, Worcester, Mass.
M. F. Cunningham, Waltham Grinding Wheel Company, Waltham, Mass.
Geo. Henderson, Dorchester Pottery Works, Dorchester, Mass.
Harold E. Bigelow, New England Porcelain Co., Hudson, Mass.
J. Fred Stingel, New England Porcelain Co., Hudson, Mass.
Arthur E. Baggs, The Marblehead Potteries, Marblehead, Mass.
C. H. Lawson, Waltham Grinding Wheel Company, Waltham, Mass.
Ross C. Purdy, American Ceramic Society, Columbus, Ohio.

General Secretary, Ross. C. Purdy, gave an inspiring talk on "Recent Developments in the Ceramic Industries and the value of Coöperative Research."

This proved to be of considerable interest to all the members and brought forth many questions and discussions.

[1] Secy-Treas. New England Section.

The rest of the evening was devoted to informal discussions of general interest.

The next meeting is planned for January but the exact date has not as yet been decided upon.

ST. LOUIS SECTION MEETING

The members of the St. Louis local section held a meeting Thursday evening, November 1, 1923. Dinner was served at 6:30 o'clock following which papers and discussions were given. The program of papers included:

"Conveyor Sprayer for Enamels," by F. G. Jaeger.

"Geology of Some of Our Missouri Clays," by S. M. Richards.

"Denmark and a Little about Danish Clay Products," by Julius Keyser.

There was an excellent attendance and the usual enthusiasm which marks the meetings of the local sections was enjoyed.

NOTES AND NEWS

SHORT COURSE AT THE UNIVERSITY OF ILLINOIS

The University of Illinois announces a Short Course in Clay Working and Enameling to be given January 14 to 26, 1924.

The course is designed to meet the requirements of practical men. It will deal with the principles underlying the work of managers, superintendents, foremen, burners and others who may be concerned with the manufacture of ceramic products.

A common school education will suffice as preparation for the course. No fees are required, but a contribution of one dollar toward the expense of printing leaflets necessary in certain courses is to be made by each person upon registration.

The course of instruction will include lectures, laboratory work and informal discussions. Besides the members of the staff of the Department of Ceramic Engineering and members of the Engineering and other faculties of the University of Illinois, it is expected that R. M. Howe of The Kier Fire Brick Company, Pittsburgh, Pa., formerly of Mellon Institute, R. R. Danielson of the U. S. Bureau of Standards, and Professor A. S. Watts, Head of the Department of Ceramic Engineering of Ohio State University, will assist.

Programs may be had upon application to the Department of Ceramic Engineering, University of Illinois, Urbana, Illinois.

CERAMICS VOCATIONAL COURSE AT NEWELL HIGH SCHOOL

Under the provisions of the Act relating to the coöperative arrangement between the U. S. Government and the States for the provision of industrial training a short course has been established at the Newell, W. Va. High School under the direction of the Department of Industrial Training, at the University of West Virginia.

This course is intended to cover the principles underlying the manufacture of pottery, with as close application to shop conditions as possible. It will be continued for 17 weeks, the classes being held on two evenings each week and each period being one and

one-half hours. The instruction is being given by J. W. Hepplewhite, of the E. M. Knowles China Co., Newell, W. Va., and R. V. Miller, of the Knowles, Taylor and Knowles China Co., East Liverpool, Ohio. Both are graduates of Ohio State University. They are being assisted by A. V. Bleininger, of the Homer Laughlin China Co. Supervision of the course is being exercised by Professor Maclin, of the University of West Virginia, Morgentown, W. Va., and Prof. A. D. Osborne, Supt. of Schools, Grant District, Hancock County.

At the first meeting held, November 5th, some 30 persons enrolled but additional names are being received daily so that an enrollment of at least fifty is expected. No tuition fee is required for residents of West Virginia but a small charge will be made for those residing outside of the state to help defray that part of the cost which is paid by the Newell school district.

NEW ORGANIZATION OF POTTERY SUPERINTENDENTS AND FOREMEN

By A. V. Bleininger

On Friday, November 16th, a large number of men engaged in supervisory positions of the pottery industry gathered in the rooms of the Pottery Manufacturers Club, East Liverpool, Ohio, in response to a call by C. F. Goodwin. The object of the meeting was the discussion of the possible organization of the works superintendents and foremen into an association having for its object the exchange of experiences connected with the operation of the plants. The idea met with immediate approval and was discussed at some length by a number of persons. Herbert Goodwin was elected chairman of the organization and Charles F. Goodwin, secretary. It was decided to hold monthly meetings to be arranged by a program committee which is to be appointed prior to each session. It appeared to be the desire of the members to discuss first of all some of the rules governing the matter of discharge and the hiring of operatives as well as others having to do with the practical side of plant operation. These topics were considered at length but all action was postponed until the next meeting. It would seem that this new organization will fill a long felt want and should prove successful since it has the support of so many men active in the industry.

DEAN COOLEY RESIGNS

Resignation of Mortimer E. Cooley, dean of the College of Engineering and Architecture of the University of Michigan, as president of the American Engineering Council of the Federated American Engineering Societies was announced at the opening session of a two-day meeting of the Executive Board of the Council held in Rochester, N. Y., October 12.

Dean Cooley, in presenting his resignation to the Board, said that he retires on account of ill health. He also made it known that he has been granted leave of absence by the University of Michigan for the second half of the academic year of 1923–1924.

Dean Cooley, it will be recalled, was among the principal speakers on the opening program of the Pittsburgh Convention meeting in February, 1923.

B. A. FORD, SECRETARY NATIONAL LIME ASSOCIATION

Burton A. Ford has been named Secretary and General Manager of the National Lime Association. This action was taken at a regular meeting of the Board of Directors, held in Chicago on October 11, 1923.

For the past three months Mr. Ford has been Acting Secretary of the Association, having been appointed to this position at the Annual Convention held last June. He is a graduate of the University of Maryland, and until the summer of 1922 was with the Virginia-Carolina Chemical Company in the capacity of Division Manager, and was also Secretary-Treasurer of the Bryant Fertilizer Company. In the summer of 1922 he became Assistant to W. R. Phillips, who was then General Manager of the National Lime Association, so he is thereby well qualified to handle his present position.

MINUTES OF MEETING OF CONFERENCE ON SPECIFICATIONS FOR REFRACTORIES[1]

By R. F. Geller[2]

This was the third of a series of conferences for the purpose of preparing specifications for refractories used by the Departments of the Federal Government.

The meeting was called to order at 10:15 A.M.

The following members were present:

R. F. Geller, Vice-Chairman, Bureau of Standards.

W. L. Pendergast, Bureau of Standards.

F. J. Quirk, Treasury Department.

D. B. Downer, Navy Department.

F. M. McGeary, Navy Department.

W. A. E. Doying, Panama Canal.

W. F. Fulweiler, Chairman of Committee C-8 of the American Society for Testing Materials, 319 Arch Street, Philadelphia, Pa.

J. S. McDowell, Refractories Manufacturers Association, Harbison-Walker Refractories Co., Pittsburgh, Pa.

George A. Balz, Refractories Manufacturers Association, Seaboard Refractories Co., Perth Amboy, N. J.

L. C. Hewitt, Refractories Mfg. Association, Laclede-Christy.

M. C. Booze, Refractories Mfg. Assn., Mellon Institute, Pittsburgh, Pa.

R. M. Howe, Refractories Mfg. Assn., Kier Fire Brick Co., Pittsburgh, Pa.

F. A. Harvey, W. A. Hull and E. L. Lasier were unable to be present.

The morning session was devoted to a discussion of the Progess Report[3] of work, carried out in the Bureau of Standards on a representative number of commercial refractories, as suggested at the second conference of the series which was held on March 8, 1922.

The afternoon session was opened with a discussion lead by Mr. Fulweiler, in which a scheme for classifying refractories according to the intended service, was presented. A working basis for such a scheme has been developed by Committee C-8 of the American Society for Testing Materials and is published in a Report of Committee C-8, a reprint of which was furnished to each member. Following this discussion, the accompanying specifications for boiler setting refractories were developed and tentatively approved.

Tentative Specifications for Boiler Setting Refractories

1. **Designation.**—The material covered by these specifications is a brick of special or standard shape composed of heat resistant clay or clays and which has been burned to produce the desired strength and structure.

[1] The Bureau of Standards, Washington, D. C., Oct. 23, 1923.

[2] Vice-Chairman.

[3] R. F. Geller, "Progress Report," *Jour. Amer. Ceram. Soc.*, **6** [10], 1098 (1923).

2. Workmanship.—(1.) All brick of the nine inch series must be uniform and regular in shape. They shall not vary from specified dimensions more than $^1/_8$" in width and thickness, and $^3/_{16}$" in length. For special shape brick, no dimension shall vary more than 2.0% from the dimension specified, unless greater variation is allowed by contract, but in no case shall a variation of less than $^1/_8$" be specified.

(2.) Brick shall be compact, of homogeneous structure, free from checks, cracks, voids or soft centers. They shall be free from such swells, warps, twists, or distortions as will prevent ready and accurate laying up with a maximum joint of $^1/_8$". All corners shall be sufficiently solid and strong to prevent excessive crumbling or chipping when handled.

3. Classes.—The refractories covered by these specifications shall be divided into six classes, as follows: SH 75; H 75; H 57; M 1; H 25; and M 7.

4. Definitions. Class SH 75.—Refractories of this class are intended for use under the most severe conditions of boiler practice, such as in marine boilers used by the Navy and in plant installations designed to operate at an average rating of not less than 175. Material of this class should have high resistance to slagging, spalling and severe temperatures.

In the U. S. Navy service refractories of Class SH 75 are used in oil fired boilers operated at greater than a 500 per cent rating, and where severe vibrations and rapid changes in temperature occur. In this service the brick are secured by anchor bolts.

Class H 75.—Refractories of this class are intended for use under conditions such as are encountered in general boiler practice. For this class, resistance to slagging, spalling and high temperature is important.

Class H 57.—Refractories of this class are intended for use under conditions where resistance to spalling is not of great importance and where resistant to slagging and high temperature is important. In general boiler practice they may be used in the side walls but, if the refractories used are limited to one brand, material of Class H 75 is recommended.

Class M 1.—Refractories of this class are intended for use at moderate temperatures such as are encountered in hand-fired boilers operated at an average rating not exceeding 125. Resistance to spalling and slagging is important under these conditions of temperature.

Class H 25.—This class is intended primarily for refractories of siliceous nature and for service in which resistance to slagging and spalling is not of particular importance, but in which the refractory is expected to resist deformation under load at relatively high temperatures. In general boiler practice, such conditions are encountered in sprung arches.

Refractories of class H 25 are particularly adapted for service under conditions where reistance to deformation under load, with soaking heats at relatively high temperatures, is important but where there is no marked fluctuation of temperature below approximately 650°C.[1]

Class M 7.—This class is intended primarily for refractories of siliceous nature, for service at moderate temperatures, and under the conditions where resistance to spalling and slagging is not important, but where resistance to deformation under load is important.

Refractories of this class are particularly adapted for service under conditions where resistance to deformation under load, with soaking heats at moderate tempera-

[1] Refractories of Class H 75 which withstand the load test satisfactorily may be included in this class.

tures, is important, but where there is no marked fluctuation of temperature below approximately 650°C.[1]

5. **Qualifications. Class SH 75.**—*a.* The softening point shall be not less than that of standard pyrometric cone number 32 (approximately 1670°C).

b. The material shall withstand fifteen (15) quenchings without failure.

c. The absorption after reheating should be not less than 6% nor more than 12%, but the failure of the absorption to lie between the limits specified shall not be considered sufficient basis for rejection.

d. Refractories intended for use by the U. S. Navy and the U. S. Shipping Board shall pass the Simulative Service Test.

Class H 75.—*a.* The softening point shall be not less than that of standard pyrometric cone number 31 (approximately 1650°C).

b. The material shall withstand twelve (12) quenchings without failure.

c. The absorption after reheating should be not less than 6% nor more than 12%, but the failure of the absorption to lie between the limits specified shall not be considered sufficient basis for rejection.

Class H 57.—*a.* The softening point shall be not less than that of standard pyrometric cone number 31 (approximately 1650°C).

b. The material shall withstand five (5) quenchings without failure.

c. The absorption after reheating should be not less than 2% nor more than 12%, but the failure of the absorption to lie between the limits specified shall not be considered sufficient basis for rejection.

Class M.—*a.* The softening point shall not be less than that of standard pyrometric cone number 29 (approximately 1610°C).

b. The refractory shall withstand two (2) quenchings without failure.

Class H 25.—*a.* Siliceous refractories shall contain 70% or more, total SiO_2.

b. The softening point shall be not less than that of standard pyrometric cone number 30 (approximately 1630°C).

c. The material shall withstand eight (8) quenchings without failure.

d. The deformation under load shall not exceed three (3) per cent.

Class M 7.—*a.* Siliceous refractories shall contain 70%, or more, total SiO_2.

b. The softening point shall be not less than that of standard pyrometric cone number 28 (approximately 1590°C).

c. The material shall withstand four (4) quenchings without failure.

d. The deformation under load shall not exceed four (4) per cent.

6. **Methods of Testing.**—*A.* The content of total silica shall be determined by analytical methods described under the A. S. T. M. standard method, Serial Designation C 18–21.[2]

B. The softening point shall be determined according to the A. S. T. M. Standard Method of Test for Softening Point, Serial Designation C 24–20.

C. The quenching test shall be conducted on brick which have been heated uniformly, under no load, at 1400°C for five hours, and allowed to cool slowly to room temperature.

The quenching is conducted in the following manner: the brick is heated by placing in the door of a suitable furnace which is being held at a temperature of

[1] Refractories of Class M 1 which withstand the load test satisfactorily may be included in this class.

[2] As an alternative method the uncombined silica may be determined by petrographic analysis, in which case it shall be not less than 35% for Class H 25 and Class M 7 refractories.

850°C. The heated end of the brick should be flush with the inner face of the furnace and the outer end should be exposed to the free circulation of air.

At hourly intervals the hot end of the brick is immersed in running water for three (3) minutes and to a depth of four inches. The brick is then removed, allowed to steam in the air for five minutes, and returned to the furnace door. This cycle is repeated until the specimen has failed.

The brick is considered to have failed when the heated end has completely spalled away, or when the structure of the brick has become so weakened that it can be easily removed with the hand.

The results on any one brand shall be reported as the average of five specimens.

D. The absorption shall be determined for brick which have been heated uniformly, under no load, at 1400°C for five hours, and allowed to cool slowly to room temperature.

The test shall be conducted on specimens not less than one hundred (100) grams in weight, one specimen to be taken from each of five brick of any one brand, and the average result reported.

The per cent absorption shall be determined according to the following formula:

$$\text{Per cent absorption} = \frac{W - D}{D}.100$$

W = weight of specimen after having been boiled in water for two hours and allowed to cool with the water.

D = weight of specimen after having been dried to constant weight at 110°C.

E. The load test shall be conducted according to the A. S. T. M. Standard Method of Test for Heavy Duty Fire Clay Refractory Material under Load at High Temperatures, Serial Designation C 16–20.

F. The simulative service tests shall be conducted in the following manner:

1. Tests are conducted in small oil-fired furnaces, the dimensions and method of construction of which are shown on attached blueprint. For comparative purposes, one side wall of the combustion chamber is built up of brick and cement of approved brands and the other side wall of brick and cement of the samples under examination. Both walls are backed uniformly with three inches of insulation. An air atomizing fuel oil burner is used. The flame sweeps the length of the furnace, curves upward and returns to the front, then up the stack from which it escapes horizontally towards the rear of the furnace.

2. The test consists of two runs, each of 24 hours duration, at furnace temperatures of 1600 and 1670°C respectively.

3. During each run the following temperature determinations are made:

Furnace temperatures.

Temperatures of outer face of brickwork of each side wall at front and rear of furnace.

4. Furnace temperatures are determined at quarter-hourly intervals with a Leeds and Northrup Optical Pyrometer sighting on flame through front of furnace above burner.

5. Temperatures of the outer face of the brickwork of each side wall are determined at half-hourly intervals, with a Leeds and Northrup Optical Pyrometer sighting on the brickwork through sillimanite tubes, the ends of which are placed flush with the wall. The tubes are carefully lagged and plugged to prevent radiation losses.

6. A spalling test is conducted at the conclusion of each run by injecting cold air at high velocity into the furnace immediately after shutting off the oil supply to the burner. The injection continues until the walls are cool.

7. The comparative heat-insulating properties together with the relative conditions of the side walls determine whether or not the material under test is acceptable for use in the Naval service.

7. **Acceptance.**—For refractories other than those intended for use by the U. S. Navy and the U. S. Shipping Board, the combined results of workmanship, chemical or petrographic analysis, fusion point, quenching, and load test where required, shall be considered as a suitability test.

For refractories intended for use by the U. S. Navy and the U. S. Shipping Board, the suitability test shall include the simulative service tests, but at the discretion of the purchasing officer the simulative service test may replace all other tests included in the suitability test.

Workmanship and softening point determination shall be considered as a control test.

8. **Retesting.**—Notice of the rejection of a shipment based on these specifications must be in the hands of the consignor, unless otherwise specified, within ten days after the receipt of the shipment at the point of destination. If the consignor desires a retest, he shall notify the consignee within five (5) days of receipt of said notice.

Following the formulation of the above specifications, which were based on the results of the laboratory work carried out by the Bureau of Standards and the observations and tests conducted by the various members of the conference, the service tests submitted by Stone and Webster were taken under consideration. These were found to cover so many phases of the problem, and the data was of such detailed nature, as to require considerable study and correlation. It was, therefore, decided to give these further consideration and to report the results of this study at a later date.

The conference adjourned at 5:15 P.M.

REPORT OF CONFERENCE ON HEAT TRANSFER THROUGH WALL STRUCTURES[1]

The conference convened at 11:00 A.M. Oct. 22, 1923, Dr. H. C. Dickinson presiding.

The following persons were present:

Virgil A. Marani, The Gypsum Industries, 844 Rush Street, Chicago, Ill.

C. H. Parkin, The Vortez Manufacturing Co., Cleveland, Ohio.

Wm. Carver, The Common Brick Mfrs. Association, 2121 Discount Building, Cleveland, Ohio.

R. P. Brown, The National Lime Association, 918 G Street, Washington, D. C.

Henry E. Stringer, Hydraulic Press Brick Company, Colorado Building, Washington, D. C.

F. J. Huse, Hollow Building Tile Mfrs. Association, 111 West Washington Street, Chicago, Ill.

Dudley F. Holtman, National Lumber Mfrs. Assoc., International Bldg., Washington, D. C.

Warren E. Emley, Bureau of Standards, Washington, D. C.

E. F. Mueller, Bureau of Standards, Washington, D. C.

M. S. Van Dusen, Bureau of Standards, Washington, D. C.

H. C. Dickinson, Bureau of Standards, Washington, D. C.

The conference consisted chiefly in a general discussion of the subject of heat transfer as applied to building walls, the following being a brief report of the principal points brought out in the discussion.

[1] Held at the Bureau of Standards, Washington, D. C.

About two years ago a similar conference was held at the Bureau, several of the men listed above being present. It was the unanimous opinion at that time that an investigation of the heat transfer through, and the moisture condensation on, building walls was very desirable and should be undertaken preferably by the Bureau of Standards. Ways and means were discussed, particularly with reference to financial support, and it was the opinion that the matter should be brought to the attention of Congress, but no formal action was taken.

About a year after this, a small allotment was made to the heat division of the Bureau to begin work on the heat transfer through walls. At the present time this investigation is producing definite results on the heat transfer through wall panels 6 ft. high by 3 ft. wide, under dry conditions and with negligible wind pressure on the two sides. The temperatures on each side of the panels can be varied anywhere within the range 0°F to 120°F. The method gives the relative contribution of each of the components of the wall, as well as the outside and inside surfaces, to the total resistance to heat flow. About ten panels have been built, representing some typical walls used in the construction of small buildings. They include the following:

Brick—9″—plastered inside directly on the brick.

Brick—9″—furred and plastered on inside.

Hollow tile—9″—plaster inside, stucco outside, air spaces horizontal. Two types of tile.

Hollow tile—9″—same with air spaces vertical.

Frame wall—2 x 4 studding: sheathing, building paper, metal lath and stucco on outside: wood lath and plaster on inside.

Concrete—8″—hollow blocks. Two kinds of concrete mix, one cinder.

Brick—9″—Ideal construction containing air spaces.

The panels are not special but represent as far as possible ordinary building construction.

The present conference was called to stimulate interest in this work, with the idea of giving it financial or other support in some way, so that it will be possible to make the investigation more complete in a shorter time, and also to investigate the possible effects of the infiltration of air and the condensation of moisture.

It was suggested that this work be done in coöperation with that of the Research Bureau of the American Society of Heating and Ventilating Engineers at Pittsburgh. The exact status of their work on heat transfer was unknown to the conference. The point was brought out that although a certain amount of coöperation was desirable, yet the confidence in the results would be much greater if similar results were obtained by more or less independent means.

The question of the relative heat losses through windows, doors, walls, and ceilings was brought up and it was agreed that this was a question for which an answer was required.

The question of laboratory tests versus tests under actual service conditions was discussed at length. It was argued that tests on actual buildings exposed to the weather were required in order to get results which could be applied to practical conditions. On the other hand it was pointed out that the comparison of various constructions under such variable conditions was in all probability subject to greater uncertainty than the application of laboratory data to service conditions. In laboratory tests the conditions can be varied at will and the effect of different components of the wall determined separately, with the result that much less time is consumed in covering the entire field. Tests can be made under various wind conditions without the variability imposed by the weather outside, and the effect of the wind observed with greater certainty than could be obtained under variable conditions. It was, however, considered desirable to check the laboratory tests on a few typical walls under actual service conditions. The sug-

gestion was made that a long structure could be built containing a number of rooms, each having a different exposed wall construction. By maintaining all the rooms at the same temperature by measured heat supply, the heat transmission of the various exposed walls could be compared under the same outside weather conditions.

It was moved and carried that the participants in the conference report to the respective associations they represent the necessity for carrying on the work on heat transfer through various types of exterior walls, recommend such financial support as is necessary, take up the matter with Secretary Hoover for the purpose of obtaining his consent and support, request manufacturers to write stating what types of walls they want tested, and ask the Bureau of Standards to formulate a program.

In the discussion of this motion it was estimated that $10,000 per year would cover the cost. In case any part of this was furnished by the industries, the question of a fair apportionment would have to be decided later on the basis of the importance of the subject to the individual industry. It was also pointed out that the estimates of the Bureau for the next fiscal year (beginning July 1, 1924) include allotments for this work and that any influence brought to bear on the budget committee by the industries would go a long way toward retaining the increases asked for. As another possibility in assisting the work it was suggested that the industries might detail men to the Bureau for certain lengths of time, as research associates. In this way the men get the benefit of training at the Bureau and both the industries and the Bureau profit by the arrangement.

The motion was made and carried that the industries be requested to furnish free of charge such materials as are necessary for the conduct of the tests to be laid out by the Bureau of Standards.

The motion was made and carried that the report of the meeting be sent to all parties listed below, and that they be requested to endorse the program.

American Society of Heating and Ventilating Engineers,
American Society of Refrigerating Engineers,
American Society of Civil Engineers,
American Society of Mechanical Engineers,
American Institute of Architects,
American Concrete Institute,
American Ceramic Society,
American Face Brick Association,
Associated Metal Lath Manufacturers,
Bureau of Standards,
Common Brick Manufacturers Association of America,
Concrete Products Association,
Engineering Council,
Forest Products Laboratories,
Gypsum Industry,
Hollowing Building Tile Mfrs. Association,
National Lime Association,
National Lumber Mfrs. Association,
National Association of Building Owners & Mfrs.,
National Housing Association,
Portland Cement Association.

The motion was made and carried that the American Society of Heating and Ventilating Engineers and the American Institute of Architects be invited to join the committee.

The motion was made and carried that Mr. Marani be appointed to interview Mr. Hoover in regard to the proposed program.

The motion was made and carried that the committee be considered as an advisory committee to the Bureau of Standards, governing the work outlined, and that Mr. Holtman be appointed chairman.

NOTES FROM THE U. S. BUREAU OF MINES

Investigation of Mineral Fillers

The investigation of the availability of certain minerals for use as fillers, together with a study of their physical and chemical characteristics, and their adaptability to commercial uses, is being continued by the Department of the Interior, through the Bureau of Mines. The South has extensive deposits of clays, ochres, bauxite, talc, graphite, etc., and the purpose of this study is to determine their value for use as fillers in making linoleum, paper and other commercial products.

The laboratory study of the size and character of grains of non-metallic mineral fillers has been completed. The results show that these characteristics have an important bearing on the applicability of a mineral filler and the types of manufactured products in which it can be used.

Laboratory work on Georgia and Alabama white clays to determine their value for filler use has been completed. The samples investigated included 31 Georgia and 11 Alabama clays. Of the Georgia clays, 17 were selected for more extended semi-commercial tests, and 500-pound samples were sent to the Ceramic Experiment Station of the Bureau of Mines at Columbus, Ohio, for washing, pulverizing and dispatching to the manufacturers who are coöperating in the factory tests. The laboratory tests have shown that a number of the Georgia clays tested are equal or superior in quality to the imported foreign clays now largely used in the paper trade. The bureau's tests also indicate the clays are of value in rubber filling, and rubber manufacturers are being furnished with samples of the Georgia clays, to test their value in rubber compounding.

Electrical Conductivity of Refractory Materials at High Temperatures

Reliable and comparable data are needed on the electrical resistivity at high temperatures of the refractory materials suitable for furnace linings. In the performance of experimental work by the Department of the Interior, at the Bureau of Mines Ceramic Experiment Station, Columbus, Ohio, methods and apparatus for making such measurements have been developed. Test pieces for determination of the electrical resistance were prepared from fire clay, kaolin, alundum, diaspore, thoria, silica, zirconia, magnesite, silicon carbide, sillimanite, zirkite, and magnesium spinel. Resistance measurements have been run on half of the pieces. Carbon electrodes are employed, measurements being run in an atmosphere of pure nitrogen to a temperature of 1400°C in a gas-tight platinum-resistance furnace.

Dolomite for Refractories

Research work on the utilization of dolomite in refractories is being continued by the Department of the Interior at the Ceramic Experiment station of the Bureau of Mines, Columbus, Ohio. The main problem being studied is to combine the lime in the dolomite so that it will be nonslaking and at the same time hold up the refractories, thereby rendering available abundant deposits of dolomite for extensive use as a basic refractory. Work previously done by the Bureau of Mines on different fluxes for

rendering dolomite refractories nonslaking indicated that by careful selection and preparation, refractory bricks could be made, one of the best fluxes tried being alumina-iron flux. More recent work done by the bureau consisted of slaking time tests on varying proportions of dolomite mixed with an alumina-iron flux. The proportion of flux to dolomite was varied between 5 and 20 per cent. The refractory properties as well as the slaking tendency of these mixes were studied. After the best proportion of flux to ground rock was determined, bricks were made by the soft mud and dry press processes, using both organic and inorganic binders. Then methods of firing to produce sound bricks were studied. As a result, a composition has been found which, when compounded with the proper binder and burned after a given procedure, produces a strong, nonslaking brick of high refractoriness. The bricks are satisfactory in every respect, except that uniform shrinkage has not been completely attained. During the coming year, bricks will be produced and tried out in the industry.

Preparation of Super-Refractories

Experimental work in the development of refractories from artificial sillimanite designed to be superior to the natural refractories now in use is in process at the Northwest Experiment Station of the Bureau of Mines, Department of the Interior, at Seattle, Wash. The work is being done in coöperation with ceramic trade interests. Sillimanite is the normal silicate of alumina, containing 63 per cent Al_2O_3 and 37 per cent SiO_2, and is also made artificially in the electric furnace. The best compound found is one a little richer in alumina than the pure sillimanite. One of the principal problems is the presence of impurities in the local clays that affect the fusing point. It was found that iron oxide present as impurity could be partly removed by reduction, but magnesia and lime could not be removed.

Effect of Carbon Monoxide on Refractories

Large-scale experiments with an electrothermic dry distillation process for the treatment of zinc ores, recently undertaken by the Mississippi Valley Experiment Station of the Bureau of Mines, Department of the Interior, were hampered by the rapid disintegration of condenser linings made of ordinary fire brick. A study of the problem developed that the action of carbon monoxide was largely responsible for the disintegration, due to the increase in volume caused by carbon deposition around particles of iron oxide contained in the refractory material. Thus the trouble can be avoided by the use of iron-free refractory material. Silica brick or high-grade fire brick free from iron were found to be satisfactory. Results of these experiments have widespread application as refractory brick must withstand the action of carbon monoxide gas when used in coke ovens, in iron-blast furnaces, in producer gas flues, and in the checker work of regenerative furnaces fired with producer gas.

Refractories for Steel Making

A survey of operating conditions obtaining in open hearth steel practice will be made by the Department of the Interior, at the ceramic experiment station of the Bureau of Mines, Columbus, Ohio, for the purpose of determining wherein available commercial refractories fall short of giving ideal service. The Bureau of Mines plans later, in coöperation with the steel industry, to undertake the development of ideal refractories for specific services.

SIZES AND WEIGHTS OF HOLLOW BUILDING TILE SIMPLIFIED

As a result of a general conference of manufacturers, distributors, and users of hollow building tile held at the Department of Commerce on October 19, 1923, under the auspices of the Division of Simplified Practice, it was unanimously agreed and adopted that definite weights and sizes of that commodity be considered as the standard of practice for the industry for one year effective January 1, 1924.

A survey of variety in sizes, dimensions, and weights reported at the preliminary conference of manufacturers held at the Department on June 19, 1923, showed 36 different sizes, each made in a wide variety of weights. A compilation and review of the figures brought out by this survey was made by the Standards Committee of the Hollow Building Tile Association and was used as a basis for adoption at the general conference.

Mr. Hudson of the Division of Simplified Practice opened the conference as presiding Chairman and gave a brief outline of the accomplishments of other industries in

STANDARD LOAD BEARING WALL TILE

End Construction		Weight
3 3/4 x 12 x 12	3 cells	20 lbs.
6 x 12 x 12	6 cells	30 lbs.
8 x 12 x 12	6 cells	36 lbs.
10 x 12 x 12	6 cells	42 lbs.
12 x 12 x 12	6 cells	48 lbs.
Side Construction		
3 3/4 x 5 x 12	1 cell	9 lbs.
8 x 5 x 12	2 cells	16 lbs.
8 x 5 x 12 ("L" shaped)		16 lbs.
8 x 6 1/4 x 12 ("T" shaped)	4 cells	16 lbs.
8 x 7 3/4 x 12 (square)	6 cells	24 lbs.
8 x 10 1/4 x 12 ("H" shaped)	7 cells	32 lbs.

STANDARD PARTITION TILE

3 x 12 x 12	3 cells	15 lbs.
4 x 12 x 12	3 cells	16 lbs.
6 x 12 x 12	3 cells	22 lbs.
8 x 12 x 12	4 cells	30 lbs.
10 x 12 x 12	4 cells	36 lbs.
12 x 12 x 12	4 cells	40 lbs.

STANDARD SPLIT FURRING TILE

2 x 12 x 12	9 lbs.

STANDARD BOOK TILE

3 x 12 x 18 to 24	18 lbs. per sq. ft.

the building material field who have effected economies through the application of Simplified Practice to their commodities.

The conference decided to vote on the list submitted by sections and the discussion opened on the 12 x 12 x 12 standard load-bearing wall tile for end construction. It was contended that this size did not permit of combined brick and tile construction for the city of Washington. It was brought out by the tile manufacturers that this size

would adequately meet the requirements of any construction and that its failure to do so in Washington was due to the fact that builders in that vicinity were not using the standard size brick as adopted at the Brick Conference held at the Department of Commerce on June 21, 1923.

Mr. Sturtevant of the Association explained to the conference that the last four units of tile as listed under standard partition tile were under a course of tests at the Bureau of Standards and their findings would determine whether they would be classed as floor tile of standard weights. The remaining groups were voted on and unanimously adopted.

After considerable debate as to tolerance for weights and dimensions, it was unanimously passed that not more than 5 per cent tolerance over or under would be allowable for weights and 3 per cent over or under for dimensions covering length, width, and height.

January 1, 1924, was set as the date the recommendation should become effective and to remain in force for a period of one year from that date.

A standing committee of the conference consisting of three representatives of manufacturers, three of distributors, and three of consumers was decided upon as a means of providing a follow-up to insure the adoption of the simplifications embodied in the recommendation of the conference; to effect a greater degree of contact and coöperation between the Department and the industry; and to consider further eliminations or substitutions in the existing varieties of tile. The personnel of this committee will be announced later.

The accompanying list gives in detail the weights, sizes, and types of tile adopted at the conference.

Personnel in Attendance

Bevier, P. H., Hollow Building Tile Association, Flatiron Bldg., New York City.
Brady, Wm. G., 439 Treasury Building, Washington, D. C.
Cartwright, Frank C., Division of Building & Housing, Department of Commerce.
Dailey, E. W., North Iowa Brick & Tile Co., Mason City, Iowa.
Deckman, Chas. G., Medal Paving Brick Co., Cleveland, Ohio.
Dixon, C. W., Columbus Brick & Tile Co., Columbus, Ga.
Downer, H. C., The Malvern Fire Clay Co., Malvern, Ohio.
Ginder, J. W., Federal Specification Board, Treasury Department, Washington, D. C.
Graham, Bert J., Denison Interlocking Tile Corpn., Guardian Bldg., Cleveland, O.
Green, A. L., American Railway Association, Chicago, Ill.
Healy, John P., Building Officials Conference, 108 Municipal Bldg., Washington, D. C.
Holden, P. E., Asst. Mgr., Fabricated Production Department, United States Chamber of Commerce, Washington, D. C.
Hutton, Jr., Wm. Troy Fireproofing Co., Troy, N. Y.
Ingberg, S. H., American Society for Testing Materials, and National Bureau of Standards.
Juse, Frank J., Chief Engineer, Hollow Building Tile Assn., Chicago, Ill.
Keasbey, H. M., National Fire Proofing Co., Fulton Bldg, Pittsburgh, Pa.
Peace, T. M., Alfred, New York.
Rommel, Edward, Consolidated Clay Products Co., Canton, Ohio.
Sleeper, J. S., Secretary, Hollow Building Tile Assn., Chicago, Ill.
Snow, W. A., American Clay Products Co., 175 Fifth Ave., N. Y. City.
Straight, H. R. Hollow Building Tile Assn., Adel, Iowa.
Sturtevant, E. R., Hollow Building Tile Assn., Dallas, Texas.
Thomas, H. B., National Fire Proofing Co., 949 Broadway, New York City.

Wallace, R. G., Hollow Bldg. Tile Assn., Fulton Bldg., Pittsburgh, Pa.
Whitacre, J. B., Whitacre-Greer Fireproofing Co., Waynesburg, Ohio.
Wilson, Wm. E., Mason City Brick & Tile Co., Mason City, Iowa.
Wright, Francis, H., Hay-Walker Brick Co., 52 Vanderbilt Ave., Pittsburgh, Pa.
Yepsen, V. L., Anness and Potter Fire Clay Co., Woodridge, N. J.

DIVISION OF SIMPLIFIED PRACTICE, DEPARTMENT OF COMMERCE
HUDSON, R. M.
COLWELL, H. R.

CALENDAR OF CONVENTIONS[1]

Organization	Date	Place
AMERICAN CERAMIC SOCIETY (Annual Meeting)	Feb. 4–8, 1923	Atlantic City
American Concrete Institute	Feb. 25–28, 1924	Chicago
American Face Brick Assn.	Dec. 4–6, 1923	French Lick Springs, Ind.
American Institute of Electrical Engineers	Feb. 4–7, 1924	Philadelphia
American Malleable Castings Assn.	Jan., 1924	Cleveland, Ohio(?)
American Road Builder's Assn.	Jan. 14–18, 1924	Chicago
American Zinc Institute	May, 1924	St. Louis, Mo.
Assn. of Scientific Apparatus Makers of U. S. A.	April 18, 1924	Washington, D. C.
Common Brick Mfrs. Assn. of America	Feb. 11, 1924	Los Angeles, Calif.
Gas Products Assn.	Jan., 1924	Chicago
Hollow Bldg. Tile Assn.	Jan., 1924	Chicago(?)
Institute of Metals, Div. of American Institute of Mining and Metallurgical Engineers	Feb., 1924	New York City
Natl. Assn. Brass Mfrs.	Dec., 1923	New York City
Natl. Assn. of Stove Mfrs.	May 7–8, 1924	New York, Hotel Astor
Natl. Bottle Mfrs. Assn.	April 27, 1924	Atlantic City
Natl. Brick Mfrs. Assn.	Jan. 28–Feb. 2, 1924	Cincinnati, Ohio
Natl. Builders Supply Assn., Inc.	Feb., 1924	Chicago(?)
Natl. Electric Light Assn.	May or June, 1924	
Natl. Glass Distributors Assn.	Dec. 4–5, 1923	Pittsburgh, Pa.
Natl. Paving Brick Mfrs. Assn.	Dec., 1923	
Natl. Exposition of Power and Mechanical Engineering	Dec. 3–8, 1923	New York City
Penna. Gas Assn.	April, 1924	Atlantic City
Society of Promotion Engineering Education	July, 1924	Boulder, Colo.
Stoker Mfrs. Assn.	April or May, 1924	(?)
U. S. Potters Assn.	Dec., 1923	Washington, D. C.
Western Society of Engineers	June 4, 1924	Chicago

[1] Further information may be secured through the Chamber of Commerce of U. S., Washington, and World's Convention Dates, New York, N. Y.

American Ceramic Society

Seven Conventions in One

Hotel Traymore

Atlantic City

February 4-9 inclusive

Ceramic Art	Heavy Clay Products
Enamel	Terra Cotta
Glass	White Wares
Refractories	

An Exhibition of Products, Materials and Equipment

AUTHOR INDEX TO BULLETIN

The reference number in parenthesis refers to the *monthly* number of the *Bulletin;* the number following this is the *page* number. The letter D preceding reference number indicates that the article is a Discussion (D); the letter O means that article is original (O).

Volume 2

Allen, F. B. Notes on burning refrac. with special ref. to control of labor costs, D (9) 305.
Arnold, H. C. Zirconia in enamels, D (9) 301–02.
Audley, J. A. The Ceram. Society, O (5) 140.
Aupperle, J. A. Zirconia in enamels, D (9) 302.
Aurien, G. Substituting oil for producer gas, D (12) 373.
Austin, A. O. Calcining of clays, D (3) 21–22.
Ayars, E. E. Notes on burning refrac. with special ref. to control of labor costs, D (9) 306.

Babcock, M. G. A study of the origin and cause of stones in glass, D (9) 297.
Bales, C. E. Producer gas for burning refrac., D (12) 376.
Banner, J. H. Voluntary adoption of stand. of quality, O (6) 191.
Bates, P. H. Specif. on whiting, D (6) 178.
Beecher, M. F. A note on the requirements of sagger bodies, O (8) 251.
Binns, C. F. The art of manuf. and the manuf. of art, O (4) 55.
Blake, E. M. The College Art Association of America, O (7) 203.
Bleininger, A. V. Sagger colloquium, D (8) 256, 258, 259, 262; Specif. on whiting D (6) 179.
Bridge, L. D. Sandblast castings to be enameled, D (12) 372.
Brown, Davis. Mech. methods from clay bank to mach., D (3) 25–28.
Brown, H. T. Tentative specif. for glass house refrac., D (3) 37–38.
Burgess, G. K. The Bureau of Standards wants co-operation, O (10) 336.

Cermak, F. Sagger colloquium, D (8) 263.
Christopher, A. B. Calcining of clays, D (3) 23–24.
Clare, R. L. Mold shop practice, D (9) 299.
Clark, E. Mold shop practice, D (9) 299.
Cox, I. F. The relative merit of ht. resisting alloys for enamel burning rack, D (2) 4.

Danielson, R. R. Transparent enamels, D (9) 300; Zirconia in enamels, D (9) 302.
Donahoe, F. W. The refrac. operative institute, O (10) 331.
Dressler, C. Artistic modern faience, D (9) 286–88, 292; Training of artists for the industry, D (8) 251.
Dressler, P. H. Producer gas for burning refrac., D (12) 375.
Drake, F. V. Colloquium on feldspar specif., D (7) 220.

Ellis, J. B. Training of artists for the industry D (8) 249.

Ferguson, R. F. The slag test and the action of slag upon silica, magnesite, chrome, diaspore and fire clay refrac., D (9) 307; Why is a Ceramic Society?, O (9) 309.
Flint, F. C. Colloquium on feldspar specif., D (7) 213, 224.
Forsythe, J. H. The mech. strength of glazing glass, D (9) 294.
Franzheim, C. M. Colloquium on feldspar specif., D (7) 215–17.
Frink, R. L. Refrac. for oil-burning fur., D (3) 19.
Fulton, C. E. Historical sketch of the manuf of plate glass in America, O (4) 70.

Gates, W. D. Artistic modern faience, D (9) 289; Mold shop practice, D (9) 299; Training of artists for the industry, D (8) 251.
Geiger, C. F. Calcining of clays, D (3) 24.
Glenner, F. R. Zirconia in enamels, D (9) 301–03.
Goodwin, H. Colloquium on feldspar specif., D (7) 220; Sagger colloquium, D (8) 257, 259–62.
Grafton, C. O. Tentative specif. for glass house refrac., D (3) 36–37.
Grainer, J. Sandblast castings to be enameled, D (12) 370–71.
Greaves-Walker, A. F. Calcining of clays, D (3) 20–21, 23–24; Causes of bulges on struck-off fire clay shapes, D (5) 120–21; The flint clay situation in Pa., D (9) 304; Producer gas for burning refrac., D (12) 374.
Greene, J. F. Substituting oil for producer gas, D (12) 374.

Hansen, J. E. Sandblast castings to be enameled, D (12) 371.
Harvey, F. A. Calcining of clays, D (3) 22; The flint clay situation in Pennsylvania, D (9) 305; Silica cement, D (9) 298.
Hayes, A. Notes on burning refrac. with special ref. to control of labor costs, D (9) 306.
Hess, H. W. A study of the origin and cause of stones in glass, D (9) 297; Observations on the European glass industry, O (12) 362.
Hewitt, L. C. Notes on burning refrac. with special ref. to the control of labor costs, O (5) 109; *ibid.*, D (9) 305–7; The slag test and the action of slag upon silica, magnesite, chrome, diaspore and fire clay refrac., D (9) 308.
Hogensen, E. Sandblast castings to be enameled, D (12) 372.
Holmes, M. E. Research organization of the National Lime Association, O (5) 138.
Hornung, M. R. Sagger colloquium, D (8) 259.
Hostetter, J. C. Elimination of streaks in white opaque glass, D (3) 38; The mech. strength of glazing glass, D (9) 294; Pricing and costing graded product, D (5) 108; Sulphuring of

glasses, D (9) 295–96; Tentative specif. for glass house refrac., D (3) 36–38; Substituting oil for producer gas, D (12) 373–74.
Hottinger, A. F. Mold shop practice, D (9) 300.
Howat, W. L., and Williams, G. A. Testing barium carbonate for use in terra cotta bodies, O (6) 161.
Hull, W. A. Colloquium on feldspar specif., D (7) 223–24; Report of Committee on Stand., O (6) 151; Sagger colloquium, D (8) 253, 255–59, 261, 263.
Hunt, F. S. Colloquium on feldspar specif., D (7) 213, 215, 217, 223; Specif. on flint, D (6) 167–68; Specif. on whiting, D (6) 179.

Insley, H. E. The flint clay situation in Pennsylvania, D (9) 305; A study of the origin and cause of stones in glass, D (9) 296–97.

Jackson, C. E. Specif. on whiting, D (6) 178–79, 181.
Jaeger, E. J. Zirconia in enamels, D (9) 302; Sandblast castings to be enameled, D (12) 371–72.

Klein, A. A. Colloqnium on feldspar specif., D (7) 220.
Klinefelter, T. A. Colloquium on feldspar specif., D (7) 213, 216; Mold shop practice, D (9) 299; Sagger colloquium, D (8) 260.
Kruscn, I. A. Calcining of clays, D (3) 21, 24; The slag test and the action of slag upon silica, magnesite, chrome, diaspore and fire clay refrac., D (9) 308.

Ladoo, R. B. Colloquium on feldspar specif., D (7) 213, 219, 221–22; Specif. on flint, D (6) 169.
Langworthy, B. M. Mech. methods from clay bank to mach., D (3) 25.
Landrum, R. D. Transparent enamels, D (9) 300; Zirconia in enamels, D (9) 303.
Lindemann, W. C. Sandblast castings to be enameled, D (12) 371–72.
Littleton, J. T. Relative magnitude of radiation and convection in a muffle kiln, D (9) 303.

Manor, J. M. Colloquium on feldspar specif., D (7) 213, 215, 220, 223.
Manson, M. E. Zirconia in enamels, D (9) 302; Sandblast castings to be enameled, D (12) 371.
McDowell, J. S. Calcining of clays, D (3) 23; The flint clay situation in Pennsylvania, D (9) 304–05.
McGee, E. N. The slag test and the action of slag upon silica, magnesite, chrome, diaspore and fire clay refrac., D (9) 308.
Middleton, G. E. Inventions and patents—some phases of the patent law, O (4) 75.
Montgomery, R. J. A study of the origin and cause of stones in glass, D (9) 297.
Mueller, H. C. Specif. on whiting, D (6) 180.
Munroe, L. J. Zirconia in enamels, D (9) 302–03.

Northey. Producer gas for burning refrac., D (12) 375.

Oakley, W. W. Substituting oil for producer gas, D (12) 373.
Owens, F. T. The importance of figuring taxes into costs, O (12) 364.

Parmelee, C. W. Notes on the detn. of translucency of bodies, D (10) 325.
Payne, A. R. Elimination of streaks in white opaque glass, D (3) 38.
Pearson, J. C. The meaning and microscopic meas. of av. particle size, D (5) 121.
Pence, F. K. Colloquium on feldspar specif., D (7) 215–16; Sagger colloquium, D (8) 253, 260; Specif. on flint, D (6) 167–68–69; *ibid.*, D (6) 177–79, 180–81.
Poste, E. P. Zirconia in enamels, D (9) 301.
Potts, A. Mech. methods from clay bank to mach., D (3) 29.

Rhead, F. H. The American interest in Chinese art, D (5) 117; Relation of the Art Division to the other divisions, O (4) 59; Artistic modern faience, D (9) 289.
Rice, B. A. Zirconia in enamels, D (9) 302.
Richardson, W. D. Producer gas for burning refrac., D (12) 375–76.
Ritter, G. F. Sandblast castings to be enameled, D (12) 370.
Rodgers, J. P. Colloquium on feldspar specif., D (7) 214, 218, 222–23.
Rohrbach, C. H. Standardization of crucible sizes, O (7) 240.
Rosenhain, W. Relative magnitude of radiation and convection in a muffle kiln, D (9) 303.
Ross, D. W. Tentative specif. for glass house refrac., D (3) 29; Producer gas for burning refrac., D (12) 376.
Royal, H. F. Organization of Detroit Section, O (11) 348.

Salisbury, B. E. Colloquium on feldspar specif., D (7) 214–15, 217; Research—Its value to a mfg. executive, O (4) 52; Specif. on flint, D (6) 167–68–69; Specif. on whiting, D (6) 177–78, 180–81.
Sant, T. H. Colloquium on feldspar specif., D (7) 221.
Schramm, E. Colloquium on feldspar specif. Problems involved in writing specif. for feldspar, O (7) 210.
Schwetye, F. H. Calcining of clays, D (3) 24; Causes of bulges on struck-off fire clay shapes, D (5) 120.
Shaw, J. B. Colloquium on feldspar specif., D (7) 222.
Sheerer, M. G. Artistic modern faience, D (9) 288; Exhibition of industrially made tableware, O (7) 238.
Shively, R. R. Sulphuring of glasses, D (9) 296.
Silverman, A. Importance of pure research on glass in American universities, O (7) 206.
Simcoe, G. Specif. on whiting, D (6) 180–81.
Sladek, G. E. Colloquium on feldspar specif., D (7) 220; Sagger colloquium, D (8) 259
Smith, R. G. Calcining of clays, D (3) 22.
Sortwell, H. H. Specif. on whiting, D (6) 176, 178–79–80–81.
Sproat, I. E. Specif. on whiting, D (6) 181.
Spurrier, H. Colloquium on feldspar specif., D (7) 215–16, 219–20, 222; Notes on the detn. of translucency of bodies, D (10) 325; Sagger colloquium, D (8) 262; Specif. on flint, D (6) 167–68–69; Specif. on whiting, D (6) 177–79, 181.
Staley, H. F. Transparent enamels, D (9) 301; Zirconia in enamels, D (9) 301; Sandblast castiugs to be enameled, D (12) 371.
Stevens, W. P. Mech. methods from clay bank to mach., D (3) 28.

Stone, R. W. The flint clay situation in Pennsylvania, D (9) 304–05.
Smith. Mech. methods from clay bank to mach., D (3) 25, 27.
Sweely, B. T. Sandblast castings to be enameled, D (12) 372.

Talbot, F. Calcining of clays, D (3) 25; Causes of bulges on struck-off fire clay shapes, D (5) 119.
Tefft, C. F. Mech. methods from clay bank to mach., D (3) 25–27, 29.
Thompson, F. S. Substituting oil for producer gas, D (12) 373.
Thrower, W. J. Sagger colloquium, D (8) 262.
Totten, G. O., Jr. Artistic modern faience, D (9) 288.
Totten, M. Artistic modern faience, D (9) 292.
Treischel, C. C. Colloquium on feldspar specif., D (7) 213, 216–19, 221–24; Specif. on flint, D (6) 168; Specif. on whiting, D (6) 176.
Turner, E. Specif. on flint, D (6) 168; Specif. on whiting, D (6) 178.
Turner, J. Classification and specif. of feldspar for use in various indus., O (12) 367.

Underwood, C. A. The analysis of high alumina products, O (6) 152.

Van Schoick, E. H. Causes of bulges on struck-off fire clay shapes, D (5) 119–21; Notes on burning refrac. with special ref. to control of labor costs, D (9) 305–06.
Vollrath, W. J. Zirconia in enamels, D (9)301.

Washburn, E. W. Pricing and costing graded product, D (5) 108–9; Tentative specif. for glass house refrac., D (3) 36.
Watts, A. S. Colloquium on feldspar specif., D (7) 213, 217–18, 220, 222–23; Notes on the detn. of translucency of bodies, D (10) 324–25; Sagger colloquium, D (8) 260–63.
Webb, R. S. Tentative specif. for glass house refrac., D (3) 37.
Webster, N. E. Pricing and costing graded product, O (5) 104; *ibid.*, D (5) 108–9.
Wenning, W. F. Zirconia in enamels, D (9) 301–02; Zirconia in sheet iron enamels, O (5) 102.
Wightman, E. P. The meaning and microscopic meas. of av. particle size, O (10) 323.
Williams, A. E. The disintegration of soda lime glass in water, D (2) 5; The mech. strength of glazing glass, D (9) 294; Specif. on whiting, D (6) 182; A study of the origin and cause of stones in glass, D (9) 297.
Williams, G. A. See Howat, W. L.
Wilson, H. The Ceram. Engineering Department of the University of Washington, Seattle, Wash., O (5) 125; Sagger colloquium, D (8) 261.
Witt, J. C. The disintegration of soda lime glass in water, D (2) 5.
Wry, T. A. Transparent enamels, D (9) 300.
Wyer, S. S. Memorandum on power situation in U. S. in million h. p., O (12) 377.

SUBJECT INDEX TO BULLETIN

Alloys, heat resist. for enamel burning rack, D (2) 5.
Alumina products, chem. anal. of, (6) 152.
Apparatus, expansion, (11) 352.
Art, the Amer. interest in Chinese, (5) 117.
  the College Assn. of Amer., (7) 203.
  Division, relation of to other div., (4) 59.
  of manuf. and the manuf. of art, (4) 55.
Artistic modern faience, D (9) 286.
Artists, training of for the indus., (9) 249.

Barium carbonate for use in terra cotta bodies, (6) 161.
Bibliography, list of publications by U. S. Bur. of Mines on ceram. tech., (4) 93.
  list of publications by U. S. Bur. of Stand. on ceram. tech., (3) 46.
Bowles, Oliver, Supt. new expt. sta., (7) 236.
Bulges, causes of on struck-off fire clay shapes, D (5) 119.
Burgess, G. K., Director U. S. Bur. of Stand., (6) 191.
Burning refrac., control of labor costs, D (9) 305.
  with special reference to the control of labor costs, (5) 109.

Calcining of clays, discussion, (3) 20.
Cement silica, D (9) 298.
Ceramic eng., dept. of in Univ. of Wash., (5) 125.
  mat., ref. list of A. S. T. M. Stand., (4) 93.
  tech., list of publications on by U. S. Bur. of Mines, (4) 93.
    list of publications on, by U. S. Bur. of Stand., (3) 46.
    list of publications of, by Univ. of Ill., (4) 96.
Chemical anal. of high alumina products, (6) 152.
Chemistry, fourth conference of the International Union of Pure and Applied, (9) 317.
China plates, fund. principles in design of (4) 65.
  standard tests for rept. of conference on, (9) 320.
  ware summarized rept. of conference on elimination of excess sizes and varieties, (10) 337.
Chinese art, Amer. interest in, (5) 117.
Clay bank, mech. methods from, to machine, D (3) 25.
Clays, calcining of, D (3) 20.
Convection and radiation, relative magnitude of in muffle kilns, D (9) 303.
Cost control of, burning refrac., D (9) 305.
  labor, notes on burning refrac. with special ref. to, (5) 109.
Costing and pricing, graded products, (5) 104.
Costs, importance of figuring taxes into, (12) 364.

Data, international critical tables of numerical data on physics, chemistry and tech., note on, (10) 335.
Design of china plates, fund. principles in, (4) 65.

Editorial, ceram. school curricula, (8) 245.
  Ed. training in ceram. sci., (7) 198.
  Equipment, manufacturers and mat. producers are research engineers, (5) 99.
  He profits most who serves best, (9) 285.
  Indebtedness, (11) 343.
  Individualism in assocn. activities, (4) 49.
  Operatives institute of refrac. manuf., (10) 321.
  Our Silver Jubilee, (3) 15.
  Pioneering beyond the rim, (6) 147.
  Scien. research enters new era, (12) 359.
  Technical investigation and research by trade assn., (3) 16.
  Value of industrial research, (6) 148.
  What service should be rendered by the Amer. Ceram. Soc., (2) 1.
Education ceram. in Univ. of Wash., (5) 125.
Enamel, burning rack, the relative merit of ht. resisting alloys for, D (2) 4.
  sandblasting of castings for, D (12) 370.
  transparent, D (9) 300.
Enamels, zirconia in, D (9) 301.
  in for sheet iron, (5) 102.
Eskesen, E. V., high honor for, (7) 235.
Expansion app., autographic, (11) 352.

Faience, artistic modern, D (9) 286.
Feldspar, classification and specif. of, for various indus., (12) 367.
  fineness of grinding, (12) 368.
  for glazes, (12) 369.
  specif. colloquium on, (7) 210.
  tent. specif. for, (6) 163.
Fire brick, service classification of, by C-8, A. S. T. M., (8) 263.
Fire clay shapes, causes of bulges on struck-off, D (5) 119.
Flint, specif. covering purchase of, (6) 166.
Flint clay situation in Pa., D (9) 304.

Glass, disintegration of soda lime in water, D (2) 5.
  house refrac. tent. specif. for, D (3) 29.
  importance of pure research in Amer. indus., (7) 206.
  indus., observations on European, (12) 362.
  mechanical strength of glazing, D (9) 294.
  origin and cause of stones, D (9) 296.
  plate, historical sketch of the manuf. of in U. S. A., (4) 70.
  pricing and costing of graded products, (5) 104.
  specif. for silica sand for, (6) 182.
  white opaque, elimination of streaks in, (3) 38.
Glasses, sulphuring of, D (9) 295.
Glazing glass, mech. strength of, D (9) 294.
Graphite crucibles, standardization of, (7) 240.
  grinding feldspar, fineness of, (12) 368.

Heat resis. alloys for enamel burning rack, D (2) 4.
  transfer through wall structures, rept. of conference on, (12) 392.
Hollow bldg. tile, rept. of conference on, (8) 282.
Hollow bldg. tile simplified, (12) 397.

Inventions and patents, (4) 75.

Kiln, muffle, relative magnitude of radiation and convection in, D (9) 303.
Kilns, fuel efficiency in, note on work of Bur. of Mines, (8) 277.

Law, patent, (4) 75.
Lime Association, organized for extensive research, (9) 318.
  research organization of, (5) 138.
Lime, specif. for limestone, quicklime and hydrated lime, (6) 170.
Lind, S. C., chief chemist U. S. Bur. of Mines, (7) 237.

Mechanical methods from clay bank to machine, D (3) 25.
strength of glazing glass, D (9) 294.
Microscopic measurement of average particle size, D (10) 323.
of average particle size, D (5) 121.
Mold shop practice, D (9) 299.
Muffle kiln, relative magnitude of radiation and convection in, D (9) 303.

Oil burning furnaces, refrac. for, D (3) 19.
substituting for producer gas, D (12) 373.

Particle size, the meaning and microscopic measurement of, D (5) 121.
microscopic measurement of, D (10) 323.
Patents and inventions, (4) 75.
Pennsylvania, flint clay situation in, D (9) 304.
Plasticity, research fund at Lafayette Coll., (8) 276.
Plate glass, historical sketch of the manuf. of in U. S. A., (4) 70.
Pottery superintendents and foremen, organization of, (12) 387.
Power situation in U. S., (12) 377.
Pricing and costing graded products, (5) 104.
Producer gas for burning refrac., D (12) 374.
substituting oil for, D (12) 373.
Publication of ceram. investigations U. S. Bur. Mines, (4) 93.
on ceram. tech., U. S. Bur. Stand. list of, (3) 46.
Publications issued by Dept. of Ceram. Engineering, Univ. of Ill., list of, (4) 96.

Radiation and convection, relative magnitude of in muffle kiln, D (9) 303.
Refractory, flint clay in Pa., D (9) 304.
Refractories, burning of, control of labor costs, D (9) 305.
causes of bulges on struck off fire clay shapes, D (5) 119.
glass house, specif. for, (3) 29.
minutes of meeting of conference on specif. of, (12) 388.
for oil burning fur., D (3) 19.
operative inst. rept. of, (10) 331.
producer gas for burning of, D (12) 374.
service classification of fire brick, (8) 263.
silica cement, D (9) 298.
slag test on silica, magnesite, chrome, diaspore and fire clay, (9) 307.
with special ref. to the control of labor costs, (5) 109.
standardization of graphite crucibles, (7) 240.
Research, importance of on glass, (7) 206.
its value to a mfg. executive, (4) 52.
organization of National Lime Assn., (5) 138.
problems for thesis, (3) 45.
Research council, international critical tables of numerical data, note on, (10) 335.

Sagger bodies, note on requirements of, (8) 251
Sagger colloquium, (8) 253.
Sand blast castings to be enameled, (12) 370.
Sieve series, standard, (7) 239.
Silica cements, D (9) 298.
sand for glass, specif. for, (6) 182.
Slag test on various refrac., D (9) 307.
Soda lime glass, disintegration of in water, D (2) 5.
Specifications covering purchase of pulverized flint, (6) 166.
for feldspar, (6) 163.
feldspar colloquium on, (7) 210.
of feldspar for use in various indus., (12) 367.
for glass house refrac., (3) 29.
for limestone, quick lime and hydrated lime, (6) 170.
for refrac., minutes of meeting of, (12) 388.
for silica sand for glass, (6) 182.
for whiting, (6) 173.
Standard sieve series, (7) 239.
Standardization of crucible sizes, (7) 240.
Standards, Rept. Comm. on, (6) 151.
of quality, voluntary adoption of, (6) 191; (8) 278.
Stones, origin and cause of in glass, D (9) 296.
Sulphuring of glasses, D (9) 295.

Terra cotta bodies, testing barium carbonate for use in, (6) 161.
mold shop practice, D (9) 299.
Soc., announcement of official personnel, (6) 195.
Testing barium carbonate for use in terra cotta bodies, (6) 161.
Tests, anal. of high alumina products, (6) 152.
microscopic measurement of average particle size, D (5) 121, (10) 323.
notes on detn. of translucency of bodies, (10) 324.
slag, on various refrac., D (9) 307.
standard sieve series, (7) 239.
Translucency, notes on detn. of, D (10) 324.
Transparent enamels, D (9) 300.

Vocational course at Newell High School, (12) 386.

Washington, Univ. of, ceram. eng. dept., (5) 125.
Whiteware, specif. covering purchase of flint for, (6) 166.
Whiting, specif. for, (6) 173.

Zirconia in enamels, D (9) 301.
in sheet iron enamels, (5) 102.

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Vol. 2 February, 1923 Nos. 1 and 2

Author Index[1] to Abstracts for February

Author	Number of abstract
A. P.	81
Adamson, J.	120
Allen, A. W.	20
Anderson, R. P.	14
Anon. 1, 2, 5, 6, 7, 8, 11, 15, 30, 47, 49, 51, 53, 54, 55, 77, 78, 93, 103, 116, 117, 118, 120, 121, 123, 124, 125, 126, 138, 147, 150, 151, 152, 165, 167	
Asquith, M.	120
Bowley, H.	56
Bradley, W. E. F.	97
Brender d' Brandis, G. A.	69
Brobston, Joseph	166
Brown, J. Coggin	52, 101
Browne, C. A.	27
Bundrick, D. D.	45
Carruthers, John L.	105
Clark, F. G.	120
Clements, Fred	79
Clements, J. M.	163
Davidson, J H.	120
Dede, L.	132
Denaeyer, M. E.	58
Dorello, Primo	31
Dupuy, M. E. L.	80
Endell, K.	10
Fichter, Marcel and Andre	128
Fieldner, Arno C.	12
Fleck, C.	139
Fornander, E.	100
Fouracre, R.	38
Francis, Chas. W.	85, 87
French, J. W.	133, 135
Fricke, Robert	65, 131
Friedrich, C. O.	34
Friedrich, O.	37
Frink, R. L.	120
Fuller, J. W.	24
G. C.	155
Gaillie and Wilson	122
General Electric Co.	44
Gossner, B.	64
Grindle, A. J.	21
Hambloch, A.	164
Hartmann, M. L., Sullivan, A. B., and Allen, D. E.	82
Hedvall, J. A.	71
Heiser, A.	162
Hendrickx, Jean	169
Hess, Henry W.	127
Hirano, Kosuke	142
Holmes, C. W. H.	26
Holmes, M. E. and Fink, G. J.	157
Horstkotte, E. H.	98
Horváth, B.	61, 66
Hull, W. A.	75
Hutchinson, O. C. K.	143
Hydro-Elec. Power Comm. of Ontario	149
Itaka, Itirô	57
J. B.	154
Jakob, Max	35
Kikuta, Tario	145
Klaften	136
Klinefeldt, H. J.	16
Larmour, H. and Stevenson, W. C.	159
Leiss, C.	32
Lewis, J. V.	102
Loewen, H.	19
Lovejoy, Ellis	4
Lowry, T. M.	41
Matějka, Jos.	63
Mayers, W. S.	140
Montgomery, Graham L.	112
Nacken, R. and Schoppe, G.	161
Nelson, Roy A.	158
Neugebauer, H.	168
Neuray, L.	39
O'Neill, F.	141
Ormandy, W. R.	50
Ostwald, Wo. and Hahn, F.-V. v.	42
Parks, Charles W.	18
Popoff, A.	130
Posnjak, E. and Merwin, H. E.	67
Poste, Emerson P.	144
Preston, F. W.	137
Quigley, W. S.	92
Raphélis-Soissan, L. de	146
Rawling, S. O.	29
Rees, W. J.	84
Rennerfelt, I.	94, 95, 96
Richardson, W. D.	115

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Author Index to Abstracts for February (*Continued*)

Author	Number of abstract
Ricklefs, O.	25
Rieke, R.	104
Rochow, W. F.	76
Rose, J. B.	113
Rozlozsnik, P.	72
Ruff, Otto, Schmidt, Gerhard and Mugdan, Susanne	59
Sandstrum, C. O.	160
Schrot, P.	3
Schurecht, H. G.	83
Schwaiger, A.	109
Schwarz, M. v.	40
Selch, E.	46
Servange, Henri	148
Seydel, R.	23
Singer, F. and Rosenthal, E.	108
Sjögren, Hj.	22
Smalley, E. L.	88
Smith, T.	134
Sortwell, H. H.	114
Spindler, M.	9
Splichal, J.	62
Springer, L.	60, 111
Stansbie, J. H.	86
Stubbs, A. J.	110
Tauber, A.	106
Thorvaldson, T.	156
Tiffany, L. L.	43
Travers, M. W.	120
Troland, L. T.	36
Turner, W. E. S.	120
Turner, W. E. S. and Wilson, T. E.	120
Unger, M.	99
Van Liempt, J. A. M.	119
Visser, Chr. K.	28
Vitali, G.	89, 90
Vosmaer, A.	33
Wadsworth, Charles, 3rd	13
Waeser, Bruno	91
Watts, Arthur S.	107
Weigel, W. M.	70
Weller, H. O.	153
Wikoff, Alan G.	73, 74
Williams, G. A. and Ferguson, J. B.	68
Wilson, G. V.	48
Wolfe, Harry G.	17
Zschimmer, E.	129

General and Miscellaneous

1. Coal saving methods in brickworks. ANON. *Brit. Clayworker*, **30**, 281(1922).—The power plant is usually one of the most inefficient sections of the works. Coal should be dumped into suitable bins near the fireholes, care being taken not to waste it. Coal loses heating power by being stored in the open. It may be moved most economically by means of continuous bucket or scraper and steel link conveyors. The best way to store coal is in bins separated by means of triangular sections of corrugated iron. Considerable coal is lost in the ashes due to poor stoking and firing with too thick a bed of coal. To det. if coal is present in the ashes, put the ashes in a pan of water and stir thoroughly. If coal is present it will float. A CO_2 recorder is a good investment since the percentage of CO_2 should be high to insure efficient combustion. The following table shows the reln. between the percentage CO_2 and fuel wasted:

CO_2	5	7	9	11	13	14	%
Fuel wasted	50	35	27	23	21	20	%

H. G. SCHURECHT

2. Data for fans. ANON. *Brick Pot. Trades J.*, **30**, 11(1922).—The following data was used for successfully installing induced draft and forced draft fans of the multivane type. Let D = outside diam. of impellor in ft.; W = width of impellor in ft.; D_1 = diam. of air inlet; Q = vol. of air in cu. ft. per min.; h = water-gauge pressure in inches; N = r. p. m.; V = peripheral vel. of impeller in ft. per min; Q and h being known, the first thing is to calculate the peripheral vel.

$$V = 3330\sqrt{h}$$

The diam. of the impeller is found next

$$D = \frac{\sqrt{Q \times 3.1416}}{V \times 1.3}$$

The r. p. m. will be found from the above equation

$$N = \frac{V}{3.1416 \times D}$$

The horsepower is given by the formula

$$\text{H. P.} = \frac{Q \times h}{3500}$$

The above formulae are for fans handling air at 50°F, with forced draft fans. In the case of induced draft where the fan has to handle gases at high temps. the decreased d. of the air must be taken into consideration, and the peripheral vel. will now be found to equal

$$V = 3330 \sqrt{h \times \frac{d}{d_1}}$$

where d = density of air at 50°F and d' = density at the temp. of the flue gases; D is as before and Q is the vol. of air at the temp. of the flue gases. The horsepower required will be as before. The propns. of the fan to which the above formula are applicable are:

Width of impellor $W = \frac{D}{2}$

Number of blades = 40 for impellers 9 in. to 15 in. diam.
48 for impellers 18 in. in diam. and upward.

Depth of blades radially $= \frac{D}{10}$

The inside width of casing $= \frac{2D}{3} + 1$ in., the space between the inlet and the impeller being made up by a taper connection leading to the inside circumference of the impeller. The diam. of the air inlet = $D + 1$ in. The width of the discharge opening $= \frac{3D}{4}$. These propns. of discharge openings are maintained no matter what resis. the fan works against, the limit of which for the multi-vane fans is generally 4 to 6 ins. water gauge. The blades are bent to a radius equal to their depth in the larger sizes (30 in. diam. fan and upward) and about $^3/_4$ their depth in the smaller sizes. The above formulae and propns. are not suited for fans operating at a high pressure, such as 12 in. water gauge. The discharge area of fan (A) in sq. ft. is $A = \frac{V}{v}$ where V = vol. of air at normal temps. and pressures in cu. ft. per sec. With most makers the discharge is square in form, and is considerably smaller than that of the fan eye, which is circular, although the former has often an adapter piece fitted to it which expands from square to round, the cir. diam. being equivalent to the fan eye. This taper piece or adapter prevents a sudden drop of air speed, which would have the effect of destroying the dynamic head, and so increasing the total pressure against which the fan would have to work. The adapter can be equally efficient if constructed throughout of rectangular form, and this is nearly always resorted to in the case of fairly large installations. In usual practice the fan inlet = $^3/_4 A$. H. G. SCHURECHT

3. Adhesives. P. SCHROT. *Raw Materials Rev.*, **1**, 180(1922).—An agglutinant for veneer is prepd. by mixing together lenzin (an impure gypsum), water, a small quantity of ocher, and leather glue which has been soaked in water for some 14 hrs. O. P. R. O.

4. Burning a down-draft kiln. ELLIS LOVEJOY. *The Clayworker*, **78**, 346–8 (1922).—L. discusses the different stages of burning, namely, water smoking, oxidation, heating up, driving the heat to the bottom, and fire flashing. J. W. HEPPLEWHITE

5. Cause and prevention of smoke in the boiler house. ANON. *Brick Pot. Trades J.*, **30**, 209(1922).—To burn 1 lb. of coal economically 18 lbs of air are required which equals 234 cu. ft. The furnace temp. will be 2750°F, the boiler efficiency 80% and 10 lbs. of water will be evapd. per lb. of coal. In general practice taking the average of 1000 boilers the average wt. of air per lb. of coal was 30 lbs. or 390 cu. ft., the furnace temp. 1700°F, the boiler efficiency 60% and the evapn. per lb. of coal $7^1/_2$ lbs., 15 cwts. of coal in the first case gives the same evapn. as 20 cwts. in the second. The 25% coal not accounted for is lost as follows. One-fifth is present in the cinders and as small coal under the bars. The same amt. will escape as smoke. The balance is used in heating up uselessly 12 lb. excess air. Black smoke contains 2 grains of C per cu. ft. and if 390 cu. ft. of air is supplied per lb. of coal and this vol. heated to increased temps. it may be doubled and therefore during a black smoke period 1540 grains of coal are lost from every lb. used or over 25%. The rate of heat radiation with a furnace temp. of 2750°F is 3 times greater than when the temp. is 1700°F, therefore, with a clean boiler, 10 sq. ft. of the grate at 2750°F will do as much work as 30 sq. ft. of grate with a temp. of 1700°F. The correct ratio of the grate area to the outlet at the end of the furnace flue is important. This should be 2 to 1 but in practice it varies from 4 to 1 to 2.7 to 1. By giving all sizes of boilers the 2 to 1 ratio the thickness of the fires would be increased and this would automatically cut down the excess air, give increased furnace temp., make black smoke impossible and increase both the duty and the efficiency of both.

H. G. SCHURECHT

6. Use of hot air in continuous kilns. ANON. *Brick Pot. Trades J.*, **30**, 10–11 (1922).—The use of hot air from the cooling goods to watersmoke more brick is the most economical method of drying brick. The transference of ht. from the cooling chambers to those being smoked is effected by means of temporary pipes, the ends of which fit over the feed holes in each chamber. This flue is built along the top of the kiln and runs along its whole length. A short pipe may then be used to connect the flue with the cooling chamber and similar short pipe may connect the flue to the chamber to be smoked. When it is desired to introduce hot air into a chamber of freshly set goods, the caps on the feed holes of that chamber and also those on a chamber containing finished hot ware are removed and the damper between them opened. The increase in temp. is then measured with a thermometer. H. G. SCHURECHT

7. Corrosion in economizers. ANON. *Brick Pot. Trades J.*, **30**, 11(1922).—In the hand-fired boilers firemen rake out the cinders in the red hot state on the floor plate in front of the boilers where they are quenched with water. The vapors are condensed on the economizer tubes causing corrosion of the same. The remedy is to take the refuse direct from the fireholes into suitable receptacles and not rake them on the floor. H. G. SCHURECHT

8. Keeping water out of the clay pit. ANON. *Brick Pot. Trades J.*, **30**, 16(1922).—In open clay-pits the most satisfactory method of drainage is to dig ditches or trenches leading from various parts of the floor of the clay pit to the lowest level of the excavation and there to form a well or sump into which the water can drain and be kept clear of the working parts of the clay pit. Assuming an average rainfall of 28 in. each acre occupied by the clay hole will receive 2830 T. or over 100,000 cu ft. of water per annum. This very large vol. of water must be removed by either a pump or a syphon (the latter is cheaper but seldom applicable) into a river or drain. As occasionally the rainfall reaches 200 T., or 7168 cu. ft. of water, the catch pit should be large enough to contain at least 10,000 cu. ft. of water for each acre of soil removed, if the catch pit is 20 ft. deep it must have an area of 500 sq. ft. or 25 ft. by 25 ft. H. G. SCHURECHT

9. The firing and the heat economy of the tunnel kiln. M. SPINDLER. *Ber. der Deut. Keram. Gesellshaft*, **3** [4], 171–87(1922).—Ideal burning curves and diagrams

showing the heat distribution and losses from tunnel kilns are given. A saving of $^1/_3$ to $^1/_2$ in fuel consumption is indicated for tunnel kilns compared with round or chamber kilns. When the ratio of air to gas, the gas consumption per hr., and the velocity of the ware are correctly regulated, a high yield of first quality ware will be obtained.

E. N. BUNTING

10. The importance of scientific research in the development of the ceramic industry in North America. K. ENDELL. *Ber. der Deut. Keram. Gesellshaft*, 3 [4], 199–214(1922).—Dr. Endell describes his trip through this country, giving a description of the ceram. schools and the ceram. industries here. He was very favorably impressed by the amt. of research undertaken in ceram., and warns his countrymen that Amer. is likely to surpass Ger. not only in quantity of ceram. products but also in quality. A short history of the AMER. CERAM. SOC., and the St. Louis (1922) meeting is given and the aid given to the industries by ceram. research, especially during the War, is reviewed.

E. N. BUNTING

11. English china clay. ANON. *Times Trade Supp.* (London), 11, 19(1922).—A Boston member of the Tech. Assoc. of the Pulp and Paper Industry of America in a discussion of the relative merits of English and American clays claims that the English article is superior in colour, is more free from grit and in its greater plasticity possesses those qualities that are peculiarly essential in a coating clay. O. P. R. O.

12. Analyses of mine and car samples of coal collected in the fiscal years 1916 to 1919. ARNO C. FIELDNER AND OTHERS. U. S. Bureau of Mines, *Bulletin* 193.—Giving the results of analyses of hundreds of coals from 25 States and Alaska. Information on heating values of the coals tested, is given as of interest to users of fuel. Methods for coal sampling and analysis are given, and a bibliography of the coal resources of the world. R. R. DANIELSON

13. The twelve-hour shift. CHARLES WADSWORTH, 3RD. *Chem. & Met. Eng.*, 27, 1063–7(1922).—A discussion of the present status of this great problem, and a review of the report of the Federated Amer. Eng. Societies on The Twelve-Hour Shift in American Industry. Includes data on operation of glass, cement, lime, brick, and pottery plants. R. R. DANIELSON

14. Tables and charts for natural gas users. R. P. ANDERSON. *Chem. & Met. Eng.*, 27, 1039–40(1922).—Author gives a number of tables and charts to be used in combustion study of natural gas, including computation of excess air, CO_2, heat losses, etc. R. R. DANIELSON

15. Testing smalt blue. ANON. *Oil and Colour Trades Jour.*, 62, 1238(1922).—This blue potash glass is obtained by melting zaffer with potash and quartz. For the purest qualities pure cobalt protoxide must be used. The glass is poured into water in a melted state, whereby it becomes very brittle and can easily be powdered; scattering blue is the coarsest, and eschel the finest quality. The presence of foreign metals can largely reduce the value of the smalt; nickel turns it violet when heated, brownish when cold; iron causes a greenish shade; lead and bismuth produce a yellow, manganese a violet, copper oxide a greenish, copper suboxide a reddish coloring. Smalt is often mixed with gypsum and clay. O. P. R. O.

16. Ball and pebble milling for pulverizing and mixing. H. J. KLINEFELDT. *N. J. Ceramist*, 1 [3], 164(1921).—A paper read before the 7th. National Chem. Exposition in which the author discusses the uses of these mills. C. W. PARMELEE

17. Importance of grinding. HARRY G. WOLFE. *N. J. Ceramist*, 1 [3], 167 (1921).—Brief statement of the app. used in prepg. potters' materials. C. W. PARMELEE

18. The furnace gas producer. CHAS. W. PARKS. *The Ceramist*, 2 [1], 46–56 (1922).—A description of the furnace gas producer, and comparison of it with the producer gas installation. The furnace gas producer is a simple iron casting which is

fitted to each fire box, thus changing each into a producer. Steam is used in the operation. It may be used either with kilns or under boilers.

TABLE I.—COMPARISON COAL CONSUMPTION AND BURNING TIME

Hand Fired Kiln No. 35

Number brick	29,957
Burning time	6 days
Total coal consumption	56,270 pounds
Total ash per kiln	4,370 pounds
Coal consumption per 1000 brick	2,171 pounds

Furnace Gas Producer Kiln No. 5

Number of brick	28,153
Burning time	3 days, 14 hours
Total coal consumption	41,970 pounds
Total ash per kiln	3,210 pounds
Coal consumption per 1000 brick	1,491 pounds

Coal saving in Kiln No. 5 was 2 days and 10 hrs.

Data is given also showing the use of this gas producer under a boiler as contrasted with the results obtained with the regulation shaker grate. The author summarizes the advantages of the furnace gas producer as follows: "There is no smoke, and therefore no loss in unburned carbon and gases through the stack; no tunnels to build; no expensive burners; no expensive producers; the equipment cannot burn out; a high grade coal is not required, as any coal that will burn can be used; it can be installed as easily as grates; it brings about a better and cleaner product; and it eliminates carbon in ashes. Moreover, it is good for salt glazing, as by simply regulating the steam blast an intense heat can be obtained within the fire-box with clear oxidizing conditions, or a reducing flame can be obtained at a moment's notice, and these are the two factors of greatest importance in salt glazing." C. W. PARMELEE

19. The science of colloids. H. LOEWEN. *Chem.-Ztg.*, **46**, 449–50(1922).—Like Traube (*C. A.*, **16**, 2051), L. believes the term colloidal chemistry is a misnomer since the phenomena dealt with under this head are for the most part not strictly chem. in nature. He points out certain limitations in the theory of colloids but recognizes progress in the technical application of colloids even in the absence of a satisfactory theory.

H. B. W. (*C. A.*)

20. Artificial pebbles for tube milling. A. W. ALLEN. *Mining Sci. Press*, **124**, 405–9(1922).—Owing to the variation in the quality of the pebbles usually furnished, a series of tests are cited for the control of the flint pebbles or others to be used. (1) *Hardness.*—A test piece is cut out of the rock or pebble by a diamond drill and this piece is then revolved against a plate covered with sand for 1,000 revolutions at a uniform pressure. (2) *Toughness.*—This is measured by the blow required to fracture a specified sized piece. (3) *Abrasion.*—Abrasion is measured by the reduction caused by grinding of about 50 pieces of uniform size in a tube mill. Ordinarily the ore itself is not suitable for pebbles; the country rock, ordinarily much larger, is suitable and is used by selection of the correct sized pieces and chipping off the irregular edges, thus making pebbles of only roughly rounded form which will now not chip very much in the mill. A table giving the characteristics of rocks of different states is given and also illustration of various testing appliances are recommended. W. A. M. (*C. A.*)

21. Powdered coal as a fuel in the foundry. A. J. GRINDLE. *Trans. Am. Foundrymen's Assoc.*, **28**, 303–12(1921); *J. Inst. Metals*, **26**, 653–4(1921).—Powd. coal is consid-

ered practical in foundries using 10 tons of coal or its equiv. per day. The manner in which proper combustion can be obtained and the precautions regarding storage and conveyance to the furnace are discussed. V. O. H. (*C. A.*)

22. Artificial precious stones. Hj. Sjögren. *Årksbok Svenska Vet.-Akad.*, **1921**, 288–313; *Mineralog. Abstracts*, **1**, 382.—A review of the literature on artificial gemstones (corundum and spinel) dealing with the production on a com. scale, and the criteria for distinguishing them from natural stones. E. F. H. (*C. A.*)

23. Draft, resistance to draft, and progression of the fire in annular kilns. R. Seydel. *Tonind. Ztg.*, **46**, 64–5, 81–2(1922); *Chimie et industrie*, **8**, 613(1922).—A general discussion of the effects of variations in the resistance offered to the draft, and of the best manner of disposing the bricks to be baked in order to prevent such variations. A. P.-C. (*C. A.*)

24. Application of pulverized coal to boilers. J. W. Fuller. *Trans. Am. Inst. Mining Met. Eng.*, **66**, 701–10(1922); cf. *C. A.*, **16**, 813.—Discussion. J. L. W. (*C. A.*)

25. The use of low-grade fuels in the brick industry. O. Ricklefs. *Arch. Wärmewirtschaft*, **3**, 79–82(1922).—Peat and lignite are good fuels for ring ovens as they give long flames. More heating surface must be provided. Operating details of successful plants are given, and faults pointed out. E. W. T. (*C. A.*)

26. Investigation of the factors influencing the grain and bond in molding sands. C. W. H. Holmes. *J. Iron Steel Inst.*, Advance proof, 22 pp.(1922).—The mechanical and physical properties of sand for gray-Fe founding are as important as the chem. analysis. The bond adsorption value obtained on the raw sand may be greatly modified by mechanical treatment. The most successful molding sands contain both static and mobile bond. An appreciable degradation of the grains of a molding sand occurs during the mechanical prepn. as usually effected. The bond distribution factor is a characteristic of molding sands that is of great importance in view of the excessive degradation which may be caused by prolonging milling beyond the time needed to effect the optimum distribution. No single test is sufficient on which to judge the practical value of many molding sands, but a careful consideration of all those tests mentioned should be included. V. O. H. (*C. A.*)

27. Early chemical industry in America. A few comparisons of past and present conditions. C. A. Browne. *J. Ind. Eng. Chem.*, **14**, 1066–71(1922). E. J. C. (*C. A.*).

28. Weathering of Belgian bricks. Chr. K. Visser. *De Ingenieur*, **37**, 135–41 (1922).—Bricks, manufd. in Belgium and used for building in Holland, frequently become covered with a mold-like efflorescence, then crack and become soft and brittle. The efflorescence is almost entirely $MgSO_4$. The crystn. of this salt, involving an increase of vol., causes the disintegration of the brick. From new bricks up to 2.38% $MgSO_4$ can be extd. by H_2O. The clay from which the bricks are made contains much less $MgSO_4$ than the bricks; a part of the S is believed to be derived from the combustion gases of the furnace. If the bricks are heated to 900° $MgSO_4$ can no longer be extd. Heating to 900° or higher is, therefore, the best way of obtaining bricks which do not decay, even if $MgSO_4$ is present. Another remedy is the use of "fat" cement, contg. much $Ca(OH)_2$, which decomposes $MgSO_4$, forming insol. $Mg(OH)_2$, thus preventing efflorescence. R. B. (*C. A.*)

Apparatus and Instruments

29. Electric heating and controlling apparatus for small thermostat. S. O. Rawling. *J. Soc. Chem. Ind.*, **41**, 250–1T(1922).—This control operates by short circuiting a part of the resistance in series with an elec. heater when the temp. falls below the working level. Short circuiting is done by a relay system operated by a regulator consisting of a Hg make-and-break actuated by expansion and contraction of toluene. The

operating temp. is easily altered by a simple adjustment of the vol. of the working fluid, and position of the contacts. With room temp. at 15°, 27 l. of H_2O are kept at 25 ± 0.02°. D. E. S. (*C. A.*)

30. A new carbon dioxide recorder. ANON. *Electrician*, **89**, 15(1922).—This CO_2 recorder is elec. in operation, requires no chem. absorbent, has no delicate glass work and is claimed to be very active and sensitive. The meter contains 2 identical spirals of Pt wire enclosed in separate cells in a metal block. One cell contains air satd. with water vapor and the other is open to the flue gases. The Pt spirals form 2 arms of a Wheatstone bridge circuit. When the current flows, the spirals become heated, losing heat to the walls of the cell, their temps. and resistances depending on thermal conductivities of gases surrounding them. CO_2 changes in the gas cause changes in its cond. and a consequent change in the galvanometer deflection. The indicating or recording galvanometer may be calibrated to give direct readings on % CO_2. A portable CO_2 and temp. outfit is illus. and briefly described. It is enclosed with the recorder. Current is supplied by dry cells fitted into the lid of the case. When CO_2 readings are desired the flue gases are drawn past the CO_2 water by pressing a rubber bulb and the multiway switch is turned to the CO_2 position. For temp. readings a thermocouple is placed in the flue and connected by the 2 terminals, and the switch is turned to the position marked "couple." Each app. is illus. W. H. B. (*C. A.*)

31. A new thermo-regulator for the thermostat. PRIMO DORELLO. *Arch. farmsper.*, **33**, 184–5(1922).—The jacket of the thermostat is filled with mineral oil which has a coeff. of expansion about twice that of H_2O. The upper surface terminates in a tube of such diam. that the change in vol. of the oil caused by a rise or fall of 1° causes a difference in level of 1 cm. in the tube. A float in the tube is connected with a lever which makes and breaks the current passing through the heating coil. The oven is const. to 1° and may be set for temps. between 30° and 60°. A. W. D. (*C. A.*)

32. Refractometer for the determination of solid and liquid substances. C. LEISS. *Z. Krist.*, **56**, 524–6(1921).—Description with fig. of an instrument of the hemisphere type with several new appliances increasing its convenience and accuracy. P. B. (*C. A.*)

33. Electric precipitation of dust. A. VOSMAER. *Chem. Weekblad.*, **18**, 262–3 (1921).—A review of methods used in copper refineries, tunnels and cement works. NATHAN VAN PATTEN (*C. A.*)

34. Electrical flue-gas examiner. C. O. FRIEDRICH. *Chem.-Ztg.*, **46**, 848(1922).—An app. is described for the continuous examn. of flue gases. The flue gases pass over a wire which is elec. heated by a feeble current. The change in the resistance of this wire is measured by means of a Wheatstone bridge arrangement with which is connected a continuous recording device. Since the thermal cond. of CO_2 is only about 0.5 that of air or CO, the resistance of the wire is greater the higher the CO_2 content in the flue gases. H. JERMAIN CREIGHTON (*C. A.*)

35. Measurement of thermal conductivity of liquids, insulators, and metals. MAX JAKOB. *Z. Ver. deut. Ing.* **66**, 688–93.—J. describes the methods and procedure, which are very similar to those already used for water (*C. A.*, **15**, 977). For application in modern technical practice the temp. coeff. of the cond. is shown to be important. J. had found this positive for water, and equal to 0.003, while Lees had found it negative. For toluene at 20°, 0.000443 is found (much higher than results by most other experimenters). Lees' result for alc. is pronounced unsatisfactory. Some 30% Ni steels gave the very low value of around 0.029 at about room temp., 0.031 at 72° The importance of such metals is emphasized. W. P. W. (*C. A.*)

36. Report of committee on colorimetry for 1920-21. L. T. TROLAND. *J. Optical Soc. Am.*, **6**, 527–96(1922).—An attempt is made: (1) to clarify and standardize color

terminology; (2) to compile data fundamental to color science; (3) to specify standard stimuli and conditions for practical work; and (4) to encourage discussion and research along these lines. F. O. A. (*C. A.*)

37. Apparatus for measuring high temperatures. O. Friedrich. *Z. Sauerstoff-Ind.*, **13**, 117–20(1921); *Chimie et industrie*, **8**, 589(1922).—The *Holbern-Kurlbaum pyrometer* consists of a telescope focused on the body or the point of which the temp. is required. An incandescent elec. bulb is placed in the telescope in such a manner that the image of the filament is projected on the incandescent surface. By means of a suitable resistance, the intensity of the filament is adjusted so that its image loses itself in that of the hot body. At this point the temps. of the two are same. It is obtained from the deflection of a suitably calibrated galvanometer. The *ardometer* is intended to be attached to the wall of a furnace, for example. The radiations from the incandescent body are concd. by means of lenses on a small metal plate which heats up. It is placed at the junction of a thermoelec. couple. A. P.-C. (*C. A.*)

38. A simple instrument for testing refractive indices of liquids. R. Fouracre. *Pharm. J.*, **109**, 88–9, 105; *Chemist and Druggist*, **97**, 169–70(1922).—A small elec. bulb is used as the object and placed in the focus of a convex lens. The beam of parallel rays produced is sent downward through the combination of a convex lens resting on a glass plate, with the liquid to be examd. between the two. By moving the combination, along a vertical scale, the light is brought to a focus on a plane surface, showing the image of the filament. The distance between the upper surface of the glass plate and the image will be the focal length (*d*) of the combination of lenses. The focal length of the glass lens used being known, *e. g.*, 20 cm., then $n_{\text{liquid}} = 2 - 20/d$. The development of this formula is given. A table shows values of *n* for changes of *d* from 20 cm. to 61 cm. For a 20 cm. length, *n* varies from 1.000 to 1.672. The temp. of the liquid may be taken into account by putting the glass plate and lens into H_2O of the required temp. for a few min. before use. S. Waldbott (*C. A.*)

39. Modern radiation pyrometers. L. Neuray. *Rev. universelle mines*, **6** [6], 127–43(1920); *J. Inst. Metals*, **26**, 580.—The theory and design of radiation pyrometers are discussed, and descriptions are given of all the best-known makes. H. G. (*C. A.*)

40. A jointed microscope for laboratories and work shops. M. v. Schwarz. *Z. Metallkunde*, **12**, 366–7(1920).—A microscope with adjustable socket joints for the examn. of large specimens and of specimens in position is described and illustrated. R. S. W. (*C. A.*)

41. A new elutriator for rapid use. T. M. Lowry. *J. Oil Colour Chem. Assoc.*, **5**, 92–3(1922).—A serious objection to the use of the elutriator for controlling the efficiency of a grinding plant is that it is necessary to take out and weigh the coarse residue remaining after elutriation. This may be overcome by gradually tapering the lower end of the vertical tube into a graduated capillary of 2 mm. diam. After calibrating the tube for a given substance, residues can be read volumetrically. Illus. Discussion. F. A. Wertz (*C. A.*)

42. Kinetic flocculation meters. I. Wo. Ostwald and F.-V. v. Hahn. *Kolloid-Z.*, **30**, 62–70(1922).—A 2-legged flocculation meter has been developed from Wiegner's app. for soil analysis (*C. A.*, **14**, 84). It consists of two tubes 130 cm. long, joined in a U by a capillary at the bottom and fitted with a scale near their upper ends. It depends on the change in d. of the soln. during flocculation and sedimentation. The comparison liquid is placed in the narrower tube, which has a stop-cock at the top and the soln. in the wider one which has a stoppered outlet at the bottom. Both tubes are fitted with bulbs which minimize the errors due to mixing. The app. is filled and the stop-cock opened. The difference in level is read immediately and at intervals thereafter. The app. was used with Ag_2S and HgS solns. The difference in level is plotted

against the time in min. after addition of an electrolyte. When 25 millimoles of KCl per l. were added to Ag_2S soln. made from 0.1 N $AgNO_3$, a coarse dispersion, which started to settle immediately, resulted. Sedimentation started only after 25 min. with a sol made from 0.00286 N $AgNO_3$ soln. Sols of intermediate concns. gave points between, and a curve connecting these points forms the *stability surface* characteristic of the soln. Increasing the concn. of KCl decreased the stability surface. HgS solns. were much more stable than Ag_2S. In the 1-legged flocculation meter the soln. is used to confine a gas under diminished pressure. As the flocculation proceeds, the change in height of the soln. is detd. at intervals. The 1-legged meter is more sensitive to temp. than the 2-legged one but the differences in level are greater and there is no mixing of liquids. The former was tried with *Ag_2S, HgS, mastic*, and *Au solns.* It gave a stability base-line when the change in level was plotted against the time. The time to the beginning of sedimentation with Ag_2S solns. was the same with both instruments. A blue Au soln. started to settle in 4 min., a red one in 16. Peptization probably could be measured with either app. WM. STERICKER (*C. A.*)

PATENTS

43. Viscosimeter. L. L. TIFFANY. U. S. 1,427,922, Sept. 5. The app. comprizes tubes of glass or other transparent material, in which oil or other substance to be tested is placed, and grooved plungers fitting snugly within the tubes serve as testing devices by the time required for their descent by gravity through the material. (*C. A.*)

44. Thermostats. GENERAL ELECTRIC CO. Brit. 181,645, Oct. 11, 1921. Bi-metallic-strip thermostatic elements, particularly those intended to be heated by an elec. current are formed of two materials both having relatively high elec. resistance but with thermal characteristics which are dissimilar even at high temps., such as 500°F. Preferably, the materials of both portions of the strip contain a substantial % of Ni, one being composed of a nickel steel alloy such as invar, and the other being composed of a Ni-Cu alloy or of nichrome. Suitable proportions for a Ni-Cu alloy are 82% of Cu and 18% of Ni. (*C. A.*)

45. Thermometer support for use in kilns. D. D. BUNDRICK. U. S. 1,430,937, Oct. 3. A frame is provided with a handle and cross bars for holding wet and dry bulb thermometers. (*C. A.*)

Chemistry, Physics and Geology

46. The dissociation of clay by lime. E. SELCH. *Sprechsaal*, **55**, 1, 2(1922).—In previous work (*Sprechsaal*, **173**, 1916), the effect of CaO upon ceram. bodies was studied. After the bodies had been fired the silicic acid and alumina sol. in HCl and NaOH were detd. At cone 04a it is necessary to have two mol. of CaO present to decompose one mol. of clay. After firing at cone 9 it is necessary to have only one mol. of CaO present to decompose one mol. of clay. In this work the above tests were continued more thoroughly. Different mixt. of lime and clay were fired to different temps. and the per cent material sol. in HCl and NaOH were detd. It was found that the higher the lime content the more thoroughly was the clay decomposed after firing. A mixt. of one mol. clay and 2 mol. of CaO is almost entirely sol. in HCl after firing to cone 1a. The CaO even when fired to a high temp. in a lime-clay mixt. is almost entirely sol. in HCl. In some cases the mixt. becomes more sol. when fired to the higher temps. whereas in others it becomes less sol. H. G. SCHURECHT

47. Formation of clays. ANON. *Brick Pot. Trades J.*, **30**, 14(1922).—The big difference in the properties of clays from various localities is attributed to their different methods of formation. Feldspars appear to be the origin of true kaolins whereas the clays derived from porphyry and basalt appear to be different from kaolins. The climatic conditions under which clays are formed are also important. In tropical

climates laterites are formed with a considerable amt. of iron, but in milder climates clays containing less iron are formed. The difference lies in the effect of humus on the formation of the clay, the propn. of humus being greatest in milder climates. The method of transportation whether by water, ice or wind also exerts an important influence on the properties of clays. Fire clays although free from most of the fusible impurities often have nodules of pyrites and marcasite which have been formed by the decomps. of vegetable matter in clay, and its action on the iron compds. present.

H. G. SCHURECHT

48. Bauxite clay. Ayrshire. G. V. WILSON. *Memoir Geol. Sur.* (Scotland), **1922.**—This Memoir contains an account of the geology of the Ayrshire bauxite clay deposit, its petrology, chemistry and probable mode of origin, and of its characters in the different areas where it is proved. O. P. R. O.

49. A new process for utilizing feldspar. ANON. *Can. Min. Jour.*, **43,** 790 (1922).—C. M. Brown, Toronto, has just perfected a new method of treating feldspar which makes all three of its constituent oxides commercially marketable commodities. The process is the application of acid gases to finely ground feldspar in a rotary kiln at low temperatures. The finished products are obtained by leaching and crystallization. Continuously recovering of chemicals and the avoidance of high temperature keeps the costs down to a point where operating profits are demonstrable. O. P. R. O.

50. Purification of clay. W. R. ORMANDY. *Chem. Trade Jour. & Chem. Eng.*, **69,** 750(1921).—History of osmosis method is given. In treating a very pure specimen of a well-washed English china clay by the osmose process, it has been found possible to deposit as much as 6,833 kilograms of dry-clay substance with 11.8 kilowatt-hours of current, when working at 50 volts pressure. The electro-osmotic process does not bring about any purification of the clay material in the actual osmose machine, but whatever may be the position theoretically, the fact remains that in practice such a purification is brought about, as has been proved beyond all doubt at the laboratory of the Osmosis Co., Ltd., by Mr. Lawrie, when working on tons of china clays and ball clays. (Contribution to the General Discussion on the Physics and Chemistry of Colloids and their Bearings on Industrial Questions, held by the Faraday Society and the Physical Society of London, on Oct. 25, 1920.) O. P. R. O.

51. Rocks rich in barium. (New South Wales.) ANON. *Memoir*, No. **8,** *Geol. Sur. of New South Wales.*, p. 337(1922).—A remarkable rock type has been found in the vicinity of Broken Hill, N. S. W., which appears to be unique in petrology. In hand specimen it is finely grained, of a greyish white colour, and looks not unlike an aplite. On closer view it appears to consist mostly of feldspar, with a few thin parallel streaks of a darker mineral. Its sp. gr. is notably higher than one would expect in such a rock. Analysis shows it to contain more than 9% of barium oxide, which is quite unique among silicate rocks. It seems most reasonable to suppose that the barium is contained in the feldspar, but a calculation shows that there is not enough alumina present in the rock to satisfy the feldspar formula, assuming all the barium and lime to be present in this mineral. The matter must remain unexplained for the present.

O. P. R. O.

52. Mineral colours. (India.) J. COGGIN BROWN. *Bull. Indian Industries*, No. **22**(1922).—The mineral colours may be divided into 3 groups as follows: (1) Natural mineral pigments. (2) Pigments made directly from ores or ore residues. (3) Chemically manuf. pigments. Group (1) includes the ochers, oxides, umbers, siennas, ground slate and shale. Group (2) includes sublimed white lead and sublimed blue lead (both of which are basic sulphates made directly from galena), zinc oxide and the red oxides made by burning spent pyrites. Group (3) includes a very large number of colours, such as white lead, chrome yellow, Prussian blue, etc. O. P. R. O.

53. China clay in Quebec. ANON. *Can. Chem. & Met.*, **6**, 243(1922).—The Canadian China Clay Co. is now operating deposits at Huberdeau, Quebec. The kaolin zone is about 1,000 feet wide and 7,000 feet long, but has not been fully prospected. The china clay occurs in veins and pockets in quartzite rock and although much of it is stained with iron it makes a very good fire clay. Regular mining methods are used. A shaft of 100 feet has been sunk and a lens of some 200 feet by 60 feet developed. O. P. R. O.

54. Mineral Pigments. (Queensland.) ANON. *Imperial Inst. Bull.*, **20**, 244 (1922).—In the Triassic rocks of Queensland, valuable deposits of oxides and ochers have been found. These are in the neighborhood of Cape Flattery, where there is scope for industry in earth colors. Samples of quartz sand washed from these pigment deposits in the course of refining have been investigated at the Imperial Institute, and found to be suitable for the manufacture of glass, for such purposes as the production of pale-tinted bottles. O. P. R. O.

55. Aluminium. (Russia.) ANON. *Mining Jour.*, **135**, 883(1921).—The alunite shales; the clays known as suchar and containing 40% alumina; and the nepheline rocks rich in aluminium, are not of value under present conditions. Of greater importance are the deposits of pure bauxite and similar rocks. The area of these deposits at present defined, is about 88 sq. mi., and the bauxite is irregularly distributed over this area, mostly in the form of pockets. Though bauxite deposits were discovered as long ago as 1882, only a little superficial work has been done on these Russian deposits. O. P. R. O.

56. Chemistry of alunite. H. BOWLEY. *J. Proc. Roy. Soc. W. Australia*, **7**, 48–83(1920–1).—Alunite from Kanowna (W. Australia) is white, finely cryst., very porous (28–58% air space), with sp. gr. = 2 65, n = 1.58. The transparent grains are pseudocubical rhombohedra. Eight analyses of alunite and Na-alunite are given. Up to 300° alunite is unaffected by dry heat. At 400° $4^1/_2$ mols. of H_2O are lost, by 500° the remaining $1^1/_2$ mols. are removed. On heating to 800° alunite is completely dissociated into K_2SO_4, Al_2O_3, SO_3, and H_2O. By 960° the K_2SO_4 dissociates and reacts with Al_2O_3 to form sol. K aluminate. Alunite is readily sol. in warm dil. solns. of HF, NaOH, KOH, Na_2CO_3 and hot strong H_2SO_4; slowly sol. in warm Na_2CO_3 solns.; moderately sol. in HCl and warm dil. H_2SO_4; sparingly in H_2O. It is attacked fairly readily by a $Ca(OH)_2$ soln. and appreciably by $CaCO_3$ solns. E. F. H. (*C. A.*)

57. The variation of the specific heat during melting and the heat of fusion of some metals. ITIRÔ ITAKA. *Science Repts. Tôhoku Imp. Univ.*, **8**, 99–114(1919); *J. Inst. Metals*, **26**, 505.—The sp. heats of Na, Bi, Pb, Sn and Zn have been detd. in the liquid and solid states at various temps. There is a discontinuous change on melting, being an increase for Na, Bi, and Zn, but a decrease for Pb and Sn. The sp. heat in the liquid state is independent of temp. The latent heats of fusion of the same elements have been detd. H. G. (*C. A.*)

58. The chemical constitution of feldspars. Analysis of two microclines. M. E. DENAEYER. *Bull. soc. chim. Belg.*, **31**, 131–47(1922).—Theories of the constitution of complex silicates (W. and D. Asch, "Die Silicate," Berlin, 1911; P. Erculisse, "Classification chimique des silicates naturels," Brussels, 1920; J. Jakob, *C. A.*, **15**, 36) are discussed, and an attempt is made to apply Werner's coördination theory to the problem. Some formulas based on the latter theory are given and a pseudo-phase rule diagram based on these is used to suggest the mutual relationship of quartz, orthose, plagioclases, micas, and spinels. The connection between the views put forward by Jakob and by F. W. Clarke is briefly discussed. The analysis of two microclines (triclinic potash-soda feldspars) is considered to indicate that they are built up of 3 sep. components in solid soln., and a study of results of analyses carried out by other workers tends to confirm this view. J. C. S. (*C. A.*)

59. Studies at high temperatures. XV. The vapor pressures of the alkali fluorides. Otto Ruff, Gerhard Schmidt and Susanne Mugdan. *Z. anorg. allgem. Chem.*, **123**, 83–8(1922); cf. *Ceram. Abs.*, **1** [3] 60.—Vapor pressure-temp. curves for the fluorides of Cs, Rb, K, Li and Na are given between pressures of about 50 mm. Hg and 1 atm. For exptl. methods of. The curves are roughly parallel, and the order of metals given above is the order of decreasing vapor pressure at any temp. For any given pressure Rb has a curve about 160° above Cs, K about 80° above Rb, Li about 180° above K, and Na about 30° higher yet. The centigrade boiling points are:

LiF	NaF	KF	RbF	CsF
1670	1705	1498	1408	1253

Heats of vaporization, the Ramsay-Young consts., and *critical temps.* (from the Guldberg-Guy rule) are calcd. A. E. S. (*C. A.*)

60. A simple method for the estimation of the soda content of a potash. L. Springer. *Sprechsaal*, **54**, 328(1921); *J. Soc. Glass Tech.*, **5**, 143–4.—If the alky. of a sample of potash is due entirely to Na_2CO_3 and K_2CO_3, the content of each can be detd. by a single titration with acid. With 3.45 g. of sample, each cc. of 0.1 *N* acid over the vol. required to neutralize this wt. of pure K_2CO_3(50.0 cc.) indicates 6.63% of Na_2CO_3. W. T. H. (*C. A.*)

61. Crude aluminium ores in Hungary. B. Horváth. *Termeszettud. Közlöny* (Budapest), **47**, 795–804(1915); *Mineralog. Abstracts*, **1**, 385.—Hungarian bauxite deposits are located in the Bihar Mts. Eight analyses are given. Bauxite ores of other countries are briefly discussed. E. F. H. (*C. A.*)

62. Data on colloidal clays. J. Splíchal. *Zemědělsky Archiv. Prague*, **10**, 413–31 (1919); *Mineralog. Abstracts*, **1**, 288.—The only reliable test for amount of colloidal clays in the products of weathering is that given by the hygroscopicity and not that given by the adsorption of coloring matters or salt solns. The *n*s. for various colloidal clays before and after ignition are given; also for a series of artificial gels after ignition. The *n* decreases with increasing silica. E. F. H. (*C. A.*)

63. Chemical relations of kaolinite at high temperatures. Jos. Matějka. *Chem. Listy*, **13**, 164–6, 182–5(1919); *Mineralog. Abstracts*, **1**, 287.—The soly. of kaolinite in boiling *N* NaOH at 110–1100° is given. The water goes off at 500–600°, and above 1100° there exists only a mixture of fibrolite and cristobalite, whereas at the lower temps. several Al silicates exist. E. F. H. (*C. A.*)

64. The chemical constitution of silicates. B. Gossner. *Centr. Mineral. Geol.*, **1921**, 513–25.—A theoretical paper in which G. criticizes current views as to the chem. constitution of silicates. Attempts to deduce from the chem. compn. of a crystal the constitution of the corresponding mol. unit are fallacious. It is pointed out that the existence of complex silicates such as $(SiO_4)_3Al_2Ca_3$ or Si_3O_8AlK at the high temps. at which the corresponding minerals were formed is most improbable, for the chem. affinities of silica and alumina, slight at ordinary temps., diminish at higher temps. For similar reasons, the existence in minerals of such radicals as $—Al(OH)_2$ is inconceivable. G. endeavors to show that, by postulating the existence of a limited no. of simple stable silicates as mol. individuals, the structure of more complicated silicates can be explained as due to combinations of these. Without inquiring further into the nature of the combination of the simpler silicates to the more complex forms, this may be taken as similar to that existing in cryst. double salt or in solid compds. contg. water of crystn. The simple silicates postulated are SiO_3Na_2, SiO_3Ca, SiO_3Mg, SiO_2, Al_2O_3, all of which can readily be obtained cryst. from the fused state. When water is a constituent of a silicate crystal, hydroxides such as $Ca(OH)_2$ or $Mg(OH)_2$ may be present, and, in certain circumstances, AlO_2H and AlO_3H_3, both of which are known in the cryst. state. From this point of view the compn. of several groups of minerals is discussed, particularly in

relation to the paragenesis of the minerals. As an example, in the alkali-lime-silicate group, the following formulas are given: nepheline, SiO_3Na_2, $[SiO_2,Al_2O_3]$; leucite, SiO_3K_2, $[SiO_2,Al_2O_3]$, $2SiO_2$; albite, SiO_3Na_2, $[SiO_2,Al_2O_3]$, $4SiO_2$; anorthite, SiO_3Ca, $[SiO_2,Al_2O_3]$. These formulas bring out well the relationships between the minerals of this group, the fact that nepheline and anorthite have sharp m. ps. while the others have not, and that the former pair more readily undergo secondary changes in geological deposits, for instance into zeolites, while the others behave as if they were in a sense more satd. Numerous other groups are also discussed. J. C. S. (*C. A.*)

65. Aluminium hydroxide and "aluminic acid." ROBERT FRICKE. *Z. Elektrochem.*, **28**, 357–8(1922).—Polemical against F. Goudriaan (cf. *C. A.*, **15**, 478; **16**, 2088). H. J. C. (*C. A.*)

66. Report from the chemical laboratory of the Royal Hungarian Geological Survey. B. HORVÁTH. *Magyar Kir. Földtani Intézet Jelentése* (Budapest), **1915**, 471–86; **1916**, 511–30; *Mineralog. Abstracts*, **1**, 385.—Numerous analyses of rocks, clays, soils, phosphatic earths from caves, ores, coal, and waters are given. Analyses of 4 bauxites from Com. Bihar gave: Al_2O_3 56.77–64.61, Fe_2O_3 2.84–25.82, SiO_2 1.39–11.56, TiO_2 1.05–3.86, CaO trace–3.07, MgO up to 3.05, H_2O 0.09–0.45, H_2O + 11.19–14.20%. E. F. H. (*C. A.*)

67. System Fe_2O_3–SO_3–H_2O. E. POSNJAK AND H. E. MERWIN. *J. Am. Chem. Soc.*, **44**, 1965–94(1922).—This system was investigated over the temp. range 50° to 200° and the following cryst. phases were encountered: Fe_2O_3; $Fe_2O_3.H_2O$; $3Fe_2O_3.4SO_3.9H_2O$; $Fe_2O_3.2SO_3.H_2O$; $Fe_2O_3.2SO_3.5H_2O$; $2Fe_2O_3.5SO_3.17H_2O$; $Fe_2O_3.SO_3$ (2 forms); $Fe_2O_3.3SO_3.6H_2O$; $Fe_2O_3.3SO_3.7H_2O$; $Fe_2O_3.4SO_3.3H_2O$ and $Fe_2O_3.4SO_3.9H_2O$. The conditions under which these substances are formed, the ranges of their stabilities, and their relations to one another, also some of their crystallographic and optical properties, were determined. The data obtained are presented by means of tables and graphically by means of curves and a solid model. J. M. B. (*C. A.*)

68. Diffusion of hydrogen and helium through silica glass and other glasses. G. A. WILLIAMS AND J. B. FERGUSON. *J. Am. Chem. Soc.*, **44**, 2160–7(1922).—Both H and He diffuse through silica glass. The permeability is proportional to the pressure and is an exponential function of the temp. The permeability to H becomes appreciable above 300° and to He is easily measured at 180°. At 500° the permeability to He is about 22 times that to H. Both Pyrex glass and Jena combustion glass are impermeable to H; the former, however, becomes black. The Jena glass is permeable to He. J. M. B. (*C. A.*)

69. Specific heat gases. G. A. BRENDER À BRANDIS. *Het. Gas*, **41**, 255–9(1921).—Four tables are given: (1) true sp. heat at const. pressure per kg., (2) av. sp. heat at const. pressure per kg., (3) true sp. heat at const. pressure per cu. m., (4) av. sp. heat at const. pressure per cu. m. These data cover the range of temps. from 0° to 3000°, and are for SO_2, O, N, CO, H, air, and water vapor. N. V. P. (*C. A.*)

70. The white clay industry in the vicinity of Langley, So. Carolina. W. M. WEIGEL. Bur. Mines, *Repts. Investigations*, No. **2382**, 6 pp.(1922).—Details of mining methods and prepn. for market are given. The kaolin occurs as lenses with 5 to 75 ft. overburden. Three analyses show: SiO_2 44.00–44.66, Al_2O_3 37.90–40.25, Fe_2O_3 1.43–2.53, TiO_2 1.25–1.50, CaO 0.08–0.28, MgO trace, alk. 0.40–0.77, ign. loss 12.14–13.17. Rational annal. of 2 samples showed: clay substance 99.29, 99.60; quartz 0.49, 0.16; feldspar 0.47, 0.64. The clay is used chiefly for paper making, also for pottery and china without washing. C. H. K. (*C. A.*)

71. The color of iron oxides. J. A. HEDVALL. *Z. anorg. allgem. Chem.*, **121**, 217–24(1922).—Fe_2O_3 may assume different tints depending on the temp. of formation and the duration of heating. These may all be divided into 2 groups, the bright orange,

red, and the darker colors. The first is prepd. by heating $Fe_2(SO_4)_3$ at a temp. below 650°. The differences in color may be due to different modifications or to different crystal structures. Microscopical examn. of 27 samples of Fe_2O_3 showed that all were composed of grains except that prepd. from $Fe_2(SO_4)_3$, which was in the shape of plates or scales. The difference in color is due to the difference in the reflection of light from the different shapes of crystals. F. E. B. (*C. A.*)

72. Preliminary report on the bauxite occurrences of northern Bihar (Királyerdö). P. Rozlozsnik. *Magyar Kir. Földtani Intézet Jelentése* (Budapest), **1916**, 450–4; *Mineralog. Abstracts*, **1**, 385.—These are ferruginous bauxites, red or light-brown, with Al_2O_3 over 53%. They occur as beds or lumps between limestones. Near diorite they are metamorphosed, are darker, and contain pyrite and diaspore. E. F. H. (*C. A.*)

Refractories and Furnaces

73. Fire clay refractories. Alan G. Wikoff. *Chem. & Met. Eng.*, **27**, 969–71 (1922).—An outline of manufacturing operations at the Laclede-Christy Clay Products Co., St. Louis, in the production of dry-press and stiff-mud process fire brick, special shapes, glass house refractories, and washed pot clay. R. R. Danielson

74. Manufacture of fire clay refractories. Alan G. Wikoff. *Chem. & Met.*, **27**, 505(1922).—An outline of plant operations at the Even & Howards Fire Brick Co., St. Louis. Gives a description of plant layout, of raw materials used and their preparation, and of forming, drying and burning of brick. Mfg. operations are coördinated by the planning dept. to obtain max. production efficiency. R. R. D.

75. Thermal conductivity of refractories. W. A. Hull. *Chem. & Met.*, **27**, 538(1922).—A review of the literature on thermal conductivity of refractories. Hull cites work done by Wologdine, Dudley and by Dougell, Hodsman and Cobb The latter give formula for computing coeff. of thermal conductivity (K_t) for temp. to 1000°C.

Fire clay brick, $K_t = 0.00155 + 0.25 \times 10^{-5}\, t$.

Magnesia brick, $K_t = 0.0285 - 0.379 \times 10^{-4}\, t + 0.179 \times 10^{-7}\, t^2$.

H. considers the work of latter two investigators as satisfactory for ordinary engineering purposes, but calls attention to the need for a std. method of making routine conductivity tests of commercial materials. R. R. D.

76. Refractories, with special reference of recent developments. W. F. Rochow. *N. J. Ceramist*, **1** [3], 181(1921).—General discussion of the properties of silica brick, its physical characteristics and uses in the steel and glass industry, lime kiln linings and muffle furnaces. *Clay refractories and their testing.*—Soapstone has been supplanted with good results by the use of a good quality of machine-made fire brick in the sidewalls and bottoms of lead smelting furnaces. The general trend of the development in clay refractories has been toward the use of better grades. All-clay steel-melting crucibles are more widely used now than previously. This demand is regarded as temporary, as greater care is required in handling the all-clay product. Heretofore, the English Stourbridge and Stannington clays have been used almost exclusively. Good results can now be secured with combinations of Ohio and Pennsylvania clays; in most cases even better service has resulted from the use of all Amer. clays. *Carbon or graphite refractories.*—Combinations of domestic clays have given superior service when substituted for German clays. *Basic refractories.*—Sufficient experience has been had to make evident the fact that dolomite cannot be used economically in place of magnesite. *Patent metalkase magnesia brick.*—"Patent Metalkase Magnesia Brick" are made by filling soft steel containers with ground calcined magnesite. The use of these brick promises an increased life of from 15 to 25 times over that of silica, and about three times that of magnesia brick. *Bauxite brick.*—A bauxite brick of approx. 56% alumina has been manufd. commercially for several years, which finds its chief application

as a lining of rotary kilns used for burning Portland cement, also, along the clinl lines in boiler settings. C. W. PARMELEE

77. The expansion of silica brick in coke ovens. ANON. *Brick Pot. Trades* 30, 6(1922).—Silica brick used for coke ovens in England are made of a mixt. of c and silica rock containing less than 84% SiO_2. Brick containing a higher SiO_2 cont expand too much in firing. This expansion takes place much more rapidly at high tem than it does at low temps. For this reason silica brick which may safely be fired 1200°C spall badly when fired rapidly to 1400°C. Tridymite has the least expans when heated but it has not yet been found practical to make brick wholly of tridymi The best that can be done is to burn brick thoroughly at a temp. sufficiently high reduce this expansion to a minimum which is about 1400°C. H. G. SCHURECHT

78. Mechanical handling. ANON. *Brick Pot. Trades J.*, 30, 34(1922).—The of mechanical conveyors in the place of barrows is yet in its infancy. A mechani conveyor can place brick in a drier as well as a skilled youth can place them on a dr floor. If the conveyor is to be used, however, it will be necessary to use pallet dri in the place of hot floor driers. For unloading coal and carrying it to the boiler kiln a mechanical conveyor is much more rapid than a man but where the stoker a burner have to wheel the coal as part of their daily work there is no direct gain in us a conveyor. Few firms have realized how much more clay can be loaded into wag if a mechanical loader were used instead of the men at the clay face using shov There are several mechanical loaders on the market which will work their way into bank of loose clay or shale and load it at the rate of 15 tons per hr. They consist o modified bucket elevator with self-contained engine and a device for filling the buck automatically. With such a device two men can throw down and load all the clay shale required for an output of ten million brick without the men being unduly tired. H. G. SCHURECHT

79. British Siemens furnace practice. FRED CLEMENTS. *J. Iron Steel Inst.*, 429–90(1922).—This paper does not discuss the subject from the refrac. standpoi but makes numerous references to the refrac. problems involved. The opinion v expressed that the silica brick made today can hardly be improved to meet more sev temp. conditions. Inasmuch as they are pushed to the limit at present, any increase temp. must be accompanied by changes in furnace design to keep the hotter flame fr the brickwork. He believes that 15% of the heat can be saved by insulating the generators and flues. Checkers are discussed from the following angles: (1) Corr weight of effective brickwork, (2) Maximum heating surface possible per unit volum (3) Proper distribution of gases over checkers, (4) Best velocity through the check to give the most effective heat interchange. Expts. showed that with half-hour versals the outer inch of a refrac. brick is the only effective portion and that a br 2″ thick is the most economical. The percentage of ht. interchanged is very small propn. to that which is stored in the checkers. A table of sp. hts., sp. gr., and cond tivities is given. In discussing the paper practical men do not favor insulating refr tories as the duty is more severe, but on the other hand favor water cooling. 95% the doors in the U. S. are water-cooled, while the percentage in England is low. Rosenhain erroneously states that insulation does not impose more severe condition allowance is made in the fuel used. He does not recognize the fact that the ten gradients are completely changed with insulation. R. M. HOWE

80. Properties of refractories under load at high temperatures. M. E. L. DUPU *Ceramique*, 25, 308–310(1922).—The strength of refrac. at high temps. was measu by means of impact, by increasing the load from zero at a rate of 150 kgs. per m and by means of a static load. The effect of firing temps. on a clay under load w also studied. It was found (see Fig. 1) that the clay had max. strength at 1000

when fired to 1350°C previous to testing and at 1150°C when fired to 1500°C before testing. This clay contained Al_2O_3 = 20.0, SiO_2(free) = 45.8, SiO_2(comb.) = 26.9, Fe_2O_3 = 2.1, K_2O = 0.51, Na_2O = 0.11, and ignit. loss = 6.95. The results of the tests with different loading methods are shown in Fig. 2. and indicate that the values obtained by impact and by increasing the load from zero are about the same and that these values are about $4^1/_2$ times as great as those obtained with a static load. H. G. SCHURECHT

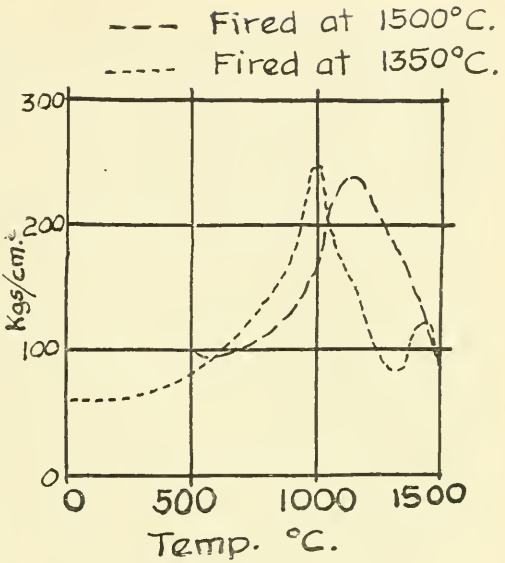


FIG. 1.

81. Carbon brick. A. P. *Deut. Töp. Ziegler Ztg.*, **53**, 219–20(1922). —The advantages of carbon brick for refrac. are: their resis. to high temps., to sudden temp. changes and their resis. to slag action. In their manuf. hard coke contg. not more than 8% ash is employed.

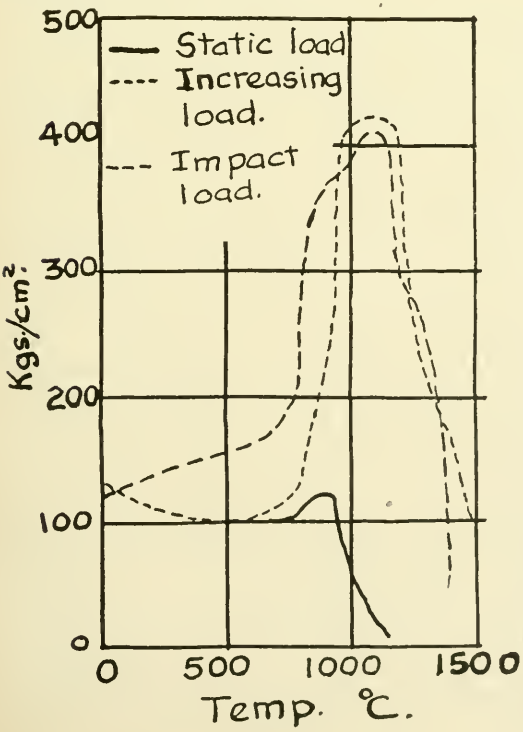


FIG. 2.

This is crushed to 2 mm. size and mixed with 20% hot tar. The batch is thoroughly pugged and the brick are molded in wooden molds. After this they are dried about 2 or 3 weeks after which they are fired. In firing they are packed in powdered coke in a sagger or partition in a kiln and fired at cone 12. Slow cooling seems necessary as rapid cooling develops cracks. In laying carbon brick a mortar containing 20% clay and 80% coke dust is used. According to Seiger (*Stahl. u. Eisen*, **41**, 1912) carbon brick are best suited for lining blast fur. producing high carbon gray iron. It is claimed by some that they are very good for the production of Thomas iron while others state that the brick soon disappear in the production of white pig iron and Thomas iron due to their oxidation. It is evident that the value of these brick for metallurgical fur. has not been thoroughly investigated. H. G. SCHURECHT

82. Electrical resistivity at high temperatures. M. L. HARTMANN, A. B. SULLIVAN AND D. E. ALLEN. *Brick Pot. Trades J.*, **30**, 16(1922).—The elec. resistivity of 9 commercial materials was detd. on $2^1/_2$-in. cubes which heated to 1500°C, the elec. resistivity being measured at intervals of 100°C. Fire-clay bricks of grade A quality and coarse texture, bauxite bricks and silica bricks with a lime bond gave regular resistivity curves. Carborundum bricks containing 95% of carbofrax C and 5% of bond gave similar curves, the resistivity being constant when the bricks were maintained at 1500°C. Carbofrax B on the contrary showed a rapid decrease in resistivity with increasing time of heating. Recrystallized carborundum ("Refrax") has quite regular curves, the resistivity being low at all temps. The resistivity curves of magnesia bricks for heating and cooling are quite different in shape, and this difference, with a peculiar flattening of the heating curves (indicating a constancy of resistance) between 1000° and 1500°C. appears to indicate that a phys. change of the structure occurs when magnesia is heated. The difference between the heating and cooling resistivity of brick made from natural zirconia is very marked. On heating the resistivity fell very rapidly until a temp. of 1200°C was reached, after which it fell very slowly indicating a permanent change on heating zirconia to 1200°C. Coarse grained chrome bricks possess low resistivities at all temps., the resistivity remaining practically constant from 1100–1200°C, increasing from 1200–1350°C and again decreasing from 1300–1500°C.

H. G. SCHURECHT

83. Bricks for malleable furnaces. H. G. SCHURECHT. *Foundry*, **50**, 707–10 (1922).—In malleable iron furnace bungs it has been found that bricks passing the usual load and softening point tests have often failed. Tentative conclusions from results, both lab. and factory, to date are: (1) burning to cone 8 gives greater resistance to spalling than burning to cone 10; (2) high load tests and fusion tests are not of first importance—good brick may or may not show high tests; (3) the spalling test seems the best guide—over 8% spalling loss (on quenching 10 times from 1350°) is dangerous; (4) bricks showing 15 to 28% porosity and 1.9 to 2.3 d. were best. SiC bricks were good but their heat cond. was too high. This could be corrected by proper insulation.

C. H. K. (*C. A.*)

84. Refractories for coke-oven construction. W. J. REES. *Fuel*, **1**, 20–2(1922); cf. *C. A.*, **16**, 2596.—The relative values of different materials for by-product coke ovens are shown by expts.: SiO_2, siliceous fire clay, semi-SiO_2 and fire-clay bricks were exposed to NaCl vapor (with and without H_2O vapor) at 800–1200°. The attack was much greater on the bricks contg. clay than on the SiO_2, the max. attack occurring with the fire clay, particularly at 900–1100°. The NaCl vapor penetrates the bricks, and the result of the slow interaction in the cooler portion and the rapid action in the hot part is to form a vesicular mass. This opens the bricks to further attack with disintegration. Expts. on a large scale, using salty coals, indicate that formation of $FeCl_3$ and NH_4Cl play an important rôle. Facing or glazing the exposed faces failed, owing to differential expansion.

C. C. D. (*C. A.*)

85. Acid electric furnace practice. CHAS. W. FRANCIS. *Iron Age*, **110**, 345–6 (1922).—The present almost universal use of acid practice in the steel foundry results from war conditions, *viz.*, scarcity of magnesite and the demand for speed. Acid practice is the fastest when ordinary specifications only are to be met. The scrap charge should be 40 to 50% foundry scrap placed on the furnace bottom and the remainder of the charge light, quick-melting, basic scrap piled in the center of the furnace where it will melt more rapidly and will not cling to side walls. No slag mixture is added as the impurities in the scrap together with washings from the lining will form sufficient slag. An acid heat should be tapped when the slag bubbles and becomes puffy, *i. e.*, a "dry" slag. For small heats the lip-pour ladle should be used rather than

a bottom-pour. Alloy additions are best made in the furnace immediately before tapping. Methods of repairing bottom and burning in a new bottom are outlined.

L. J. (*C. A.*)

86. Electric furnaces. J. H. Stansbie. *J. Birmingham Met. Soc.*, **7**, 259(1919); *J. Inst. Metals*, **24**, 488–9(1920).—S. reviews the principles underlying the generation of elec. current and the conversion of its energy into heat in elec. furnaces. The arc, resistance, and induction types of furnaces and combinations of these types are considered. Crucible furnaces in which the resistor either is external to the crucible, which is heated by radiation, or is the crucible itself, are also described.

V. O. H. (*C. A.*)

87. Basic electric furnace operation. Chas. W. Francis. *Iron Age*, **110**, 421–2 (1922); cf. Abs. **85**.—In basic practice CaO is charged with the scrap or added after partly melting down. With an oxidizing atm. and a basic slag P is removed from the metal. More than one oxidizing slag may be necessary with high-P scrap. After complete removal of the oxidizing slag, S is removed from the bath by a deoxidizing slag (CaO and C). On account of this ready removal of S, pig iron, malleable or gray iron castings are made on a basic bottom. Removal of P cannot, however, be readily accomplished in the presence of high C. Hence in the mfg. of irons low-P scrap must be used and iron practice in general becomes a melting and recarburization process. Some modern furnaces provide high and low voltage taps on the secondary thus permitting the use of a short arc on low voltage for refining after the charge has melted down. The short arc permits better control of temp. and is less destructive to roof refractories.

L. J. (*C. A.*)

88. Principles of high temperature furnace design. E. L. Smalley. *Trans. Am. Electrochem. Soc.*, **42**, preprint(1922).—The best elec. ovens, judged from the viewpoints of highest quality of products, lowest cost of operation and maintenance, and greatest safety in operation at high temps., must have these attributes: Muffled type where best suited to the process. Exposed element or radiant form only when best adapted to a process. Must have elements of sufficient number for cheap renewal. Elements must be readily and easily renewable. Coils must be fully supported, and yet free for expansion. Refractory parts must be thoroughly supported, but free for expansion. No internal connections of coils should be tolerated. Terminal sizes should be larger than the element size. Source of heat must be uniformly distributed. Size of furnace must be governed by the charge. Placement of elements should not control the furnace size. Thermal efficiency should be a controlling feature in decision. Transverse section of heating elements should be round. Exposed elements should preferably be in corrugated grooves. Elements should not be chosen to suit a voltage. Total weight of heating element should be high in proportion to the weight of the charge. Efficiency of heat insulation must be adapted to the work performed.

C. G. F. (*C. A.*)

89. The new electric furnace of the Fiat works. G. Vitali. *Stahl u. Eisen*, **42**, 921–4(1922).—A description of this new furnace of the Heroult type.

R. S. D. (*C. A.*)

90. The new electric steel furnaces of the Fiat works, Turin. G. Vitali. *Elektrotechn. Z.*, **43**, 1177–9(1922).—7 illus. A detailed description of the Fiat furnace. The 3 graphite electrodes are each 35 cm. in diam. The new electrode holders prevent unnecessary burning away of the electrodes near the roof of the furnace. In a recent test the monthly av. was 1,341,160 kg. of steel produced at a total consumption of 937,000 kw.-hrs. which includes energy required to keep the furnace warm over Sunday and holidays.

C. G. F. (*C. A.*)

91. Technical thermoelectric processes. Bruno Waeser. *Chem.-Ztg.*, **46**, 845–7 (1922).—Elec. furnaces, the materials used in their construction and their power requirements are discussed. The ash content, sp. gr., vol. of the pores, hardness and

resistance in ohms per 1 m. length by 1 mm.^{2} cross-section of 6 kinds of C electrodes are given. The processes for the manuf. of SiC and alundum are briefly surveyed. Other thermoelec. processes will be taken up in a later paper. H. J. C. (*C. A.*)

92. Refractory cements. W. S. QUIGLEY. *Trans. Am. Foundryman's Assoc.*, **28**, 479–80(1920); *J. Inst. Metals*, **26**, 655.—Q. divides bonding materials into four classes, *viz.*—(1) fire clay; (2) coarse grades of mixed materials (so-called cements); (3) cements depending upon a fibrous structure for holding component parts together; (4) cements capable of universal application. (1) and (2) have no binding strength of themselves unless subjected to a vitrifying temp., and then only a surface bond is obtained, owing to the inability of heat to penetrate the entire thickness of the wall. The result is a vitrified shell with a weak structural backing, which frequently bulges or collapses. The third type loses its binding properties as the temp. increases. The fourth type, to be of universal application, should air-set, and its binding properties should be independent of heat. It should be passed through a fine sieve so as to obviate the formation of voids between bricks. It should be capable of being used as a binder with crushed fire brick, old crucibles, fine sand, fire clay, ganister, for making rammed-in linings, and for doing repair work (unadmixed if necessary) hot or cold. It should have as nearly as possible the same coeff. of expansion as that of the materials with which it is used as a bond. A cement with a coeff. intermediate between those of fire-clay brick and silica brick (0.075 in. and 0.175 in., resp., per ft. at 1200°) could be advantageously used with either.

H. G. (*C. A.*)

93. Induction furnace for melting non-ferrous metals. ANON. *Metal Ind.*, **20**, 312–3(1922).—A new type of induction furnace for non-ferrous metals consists of a melting chamber which resembles an ordinary crucible; located beneath this melting chamber and connected with it through two parts or ducts is another chamber in the form of a hollow cylinder encircling a primary winding and one leg of a laminated core. The molten metal in this cylinder constitutes the secondary of a transformer. A positive, unidirectional circulation of molten metal between melting chamber and heating chamber (secondary) is maintained by magnetic forces. The entire lining of the furnace consists of three parts, durable and easily replaced. The furnace in starting must be primed with molten metal to fill the secondary. Continuous operation is therefore best. Power consumption has been not more than 200 kw.-hrs. per ton of brass for continuous operation. The power factor on 60 cycles is about 0.75. Metal loss is less than 1% for 60–40 yellow brass. L. J. (*C. A.*)

PATENTS

94. Electric resistance furnace adapted for heat-treating metals. I. RENNERFELT. U. S. 1,428,908, Sept. 12. (*C. A.*)

95. Electric arc furnace adapted for melting zinc. I. RENNERFELT. U. S. 1,428,-909, Sept. 12. (*C. A.*)

96. Electric furnace operation in metal refining. I. RENNERFELT. U. S. 1,428,-910, Sept. 12. A charge such as steel to be refined is first heated by a free-burning arc supplied with 2-phase current and the charge is thereafter heated by arcs in contact with its surface supplied with 3-phase current. (*C. A.*)

97. Electric furnace for ore reduction. W. E. F. BRADLEY. U. S. 1,427,436, Aug. 29. A rotary drum furnace discharges into a tilting elec. furnace and receives gases from the elec. furnace. The latter is provided with a C tuyère placed so as to be covered by the molten charge in the furnace during charging and reduction and uncovered when the furnace is in pouring position. The furnace is especially adapted for reducing Fe ores. (*C. A.*)

98. Electric resistance furnace for melting brass or copper. E. H. HORSTKOTTE.

U. S. 1,427,814, Sept. 5. The furnace comprizes resistance heaters made up of dished disks in elec. contact at a peripheral zone only and surrounded by a refractory shield. (*C. A.*)

99. Linings for induction furnaces. M. Unger. U. S. 1,429,909, Sept. 19. Closed conductors of different m. p. and which may be formed of rings of ferrous metal are placed within the heating space of a furnace and melted by an induced current to cure furnace linings of MgO and tar or other materials. (*C. A.*)

100. Reducing ores in electric blast furnaces. E. Fornander. U. S. 1,430,971, Oct. 3. An elec. furnace is used which has a vertical reducing shaft and a laterally extending melting chamber at the base of the shaft. Ore, *e. g.*, Fe oxide ore, together with limestone and other suitable additions, is charged into the top of the shaft and after the material descends into the melting chamber it is covered with C or other reducing materials. Part of the gases evolved in the shaft are forced into the melting chamber so as to pass through the reducing material. (*C. A.*)

Abrasives

101. Corundum in India. J. C. Brown. *Bull. of Indian Industries & Labour*, No. 12(1922).—Corundum is widely distributed throughout India; but as yet the statistics of production are quite incomplete. Corundum is the natural oxide of aluminium Al_2O_3. Its transparent varieties which form the ruby, sapphire, and other precious stones, are not here dealt with; only the opaque, dull and semi-translucent kinds of corundum which, on account of their great hardness, are used in the arts as abrasive materials are considered in this bulletin. O. P. R. O.

102. Abrasives. J. V. Lewis. *Mineral Ind.*, 30, 1–8(1921).—A statistical review of natural and artificial abrasives. A. B. (*C. A.*)

Stoneware, Whiteware and Porcelain

103. Blind glazes. Anon. *Brick Pot. Trades J.*, 30, 15(1922).—Some firms making glazed ware are troubled with a defect called "blind glazes." This defect consists in the formation of a dull glaze instead of a glossy one, the dullness being irregularly distributed over the ware so as to prevent their being passed as matt glazes. It is invariably brought about by improper treatment of the kilns as the firing comes to a close. It is very liable to occur where the glaze contains a considerable propn. of ZnO or CaO together with a small amount of Al_2O_3, and the kiln is soaked at the highest temp. too long. To prevent this, add clay to the glaze and cool more rapidly at the high temps. Since crystals do not readily form in a very fluid glaze, "blinding" may be sometimes overcome by finishing the fire about one cone higher. When lead glazes are used undue soaking periods at the high temps. are certain to cause this blinding. Firing with a reducing kiln atmos. or with a wet fuel will also cause this defect.

H. G. Schurecht

104. The influence of composition upon the properties of porcelain. R. Rieke. *Ber. der Deut. Keram. Gesellshaft*, 3 [4], 187–99(1922).—Nineteen porcelains made from Zettlitzer kaolin, 40–60%, Norwegian potash feldspar, 15–35%, and Hohenbockaer sand, 15–35%, where the per cent by wt. is varied in 5% steps for each constituent, and burned to cones 13 to 17, were tested for burning shrinkage, tensile strength, impact resistance, compressive strength between steel balls, sp. gr., and dielec. strength. Most of the values found are given at the points on the triaxial diagram corresponding to the compn. of the porc. E. N. Bunting

105. Notes on the shivering of terra cotta. John L. Carruthers: *The Clayworker*, 78, 235–37(1922).—See *Jour. Amer. Ceram. Soc.*, 5, 518–26(1922).

J. W. Hepplewhite

106. How flower pots are manufactured. A. Tauber. *Brick and Clay Record*, **61**, 398–401(1922).—(Translation from the German.) Discussion of requirements of finished product, selection of clays, old and modern methods of manuf.

J. W. Hepplewhite

107. Factory preparation and burning of whiteware bodies. Arthur S. Watts. *N. J. Ceramist*, **1** [2], 91–96(1921).—A discussion of the prepn. and burning of whiteware bodies covering briefly the following topics: raw materials; cleaning dirty ball clay; mixing the body: preparation of stain—the author recommends the following as the correct proportion: To 750 ozs. of pure water add 15 ozs. pure cobalt sulfate and stir until dissolved. Then add 7.5 ozs. carbonate of soda. The proper propns. of stain to body are: For a body contg. 10% ball clay, add 75 ozs. of stain soln. to each 1500 lbs. of body. For bodies with higher ball clay content increase the stain addn. in the same ratio up to 15% ball clay. For stain in glazes, add 10 ozs. of stain to each 100 lbs. of dry glaze. Glazes high in lead require more stain. *Sieves.*—Revolving sieves are less costly and do not clog so easily. *Filter press pressure.*—Max. pressure should be 80 lbs. for a body free from ball clay. Add 2 lbs. for every 1% of ball clay present. When the press stops running water increases the pressure 10 lbs. for a few min. *Aging and its effect.*—The temp. of clay cellars should be kept above 80°F and the relative humidity should be 90°. Aging is bad for elec. porcelain since it gives rise to gas blebs in the body. *Plasticity.*—Plastic clays are either "greasy" or "sticky." Eng. and Amer. clays differ in this respect. "Greasy" plasticity is preferable. *Pug mills.*—A slow rate of pugging produces an open body. A faster rate produces a granular, weak body. Too much speed causes the clay to heat. *Setting the kiln.*—The first and second rings should be set 1″ apart, except midway between the cuts, and the inside rings all set a like distance. Leave a 1″ opening between all rings. Not more than 6″ should be left between the top of the bungs and the crown at any point. In downdraft kilns, the center of the kiln may be set 12 to 15″ below the crown, and the burn improved if an opening is provided from top to bottom in center. *Kiln firing.*—For burning hard-fire porcelain, free from ball clay, with the body biscuited, the glost fire may progress as fast as the coal will burn, maintaining a condition bordering on reduction from the time the kiln is hot enough to develop such a condition, *i. e.*, from about the tenth hour. For best results, the fuel beds must never burn low enough to leak any air, as a highly oxidizing condition is as dangerous as a condition of extreme reduction. The temperature is dropped fast after finish to an orange red. Then close and cool slowly. By this plan it is possible to burn a 16′ kiln to cone 15 in 20 hrs. For *sanitary ware and electrical porcelain* the author gives the method of firing in considerable detail.

C. W. Parmelee

108. The physical properties of porcelain. F. Singer and E. Rosenthal. *Ber. deut. Keram. Ges.*, **1**, 3(1920); *Sprechsaal*, **54**, 250(1921); *J. Soc. Glass Tech.*, **5**, 175–7.—Porcelain is not a homogeneous chem. or phys. substance. Each result refers only to the particular samples examd. The sp. gr. was 2.60 to 2.62, this being reduced in final burning to 2.3 to 2.5, according to the compn. The coeff. of cubic expansion varied between 0.0000045 and 0.0000065; the following were some linear expansion coeffs.: Berlin, 0.00000177 (—191 to 16°); 0.00000366 (16 to 250°); 0.000003645 (16 to 500°); 0.00000434 (16 to 1000°); Meissen, 0.00000269 (0 to 100°); Bayeux, 0.000002522 (0°), 0.000003265 (50°), 0.000004008 (100°), 0.000004305 (120°); Rosenthal lab. porcelain 352 $\times 10^{-8}$ and insulator H, 379 $\times 10^{-8}$ (20 to 100°); Seger porcelain 6833, 380 $\times 10^{-8}$ (20 to 100°); hard porcelain glaze 271 $\times 10^{-8}$. Glaze fit depended, not only on correspondence of coeff. of expansion, but also on good elasticity, tenacity, pliability, and the resistance to stress and strain of the two components. For finished porcelain strong heating caused only a very small change of value in the thermal cond.

The mean value of the sp. heat of Berlin technical porcelain was 0.202 (20 to 200°) and 0.221 (20 to 400°). Porcelain retained heat 50 to 60 times better than iron. The heat of reaction during formation was exothermic. The modulus of elasticity for Hermsdorf porcelain gave a value of 6250 kg./mm.^{2} detd. from the values of breaking strain of rods. Observations of the bending of circular unglazed rods gave a modulus value for Berlin porcelain of 8280 kg./mm.^{2} Rods of Rosenthal porcelain gave values between 8400 and 17900 kg./mm.^{2} Values of the resistance to bending shock, as detd. by the oscillating hammer, ranged, in various types of Rosenthal porcelain, from 0.08 to 2.4 cm. kg./cm.^{2}, while resistance to compressive shock, as measured by the Martens's hammer, varied from 7 to 146 cm. kg./cm.^{2} Measurements of the hardness were obtained with any degree of regularity only by the Gary sand blast method, in which a comparison of the vols. lost under similar conditions was made. Cubic compressibility varied from 1.4×10^{-6} for highly siliceous samples to 1.8×10^{-6} for highly felspathic samples. The crushing strength showed as mean values for hard porcelain 4250 and 4780 kg./cm.^{2}; the tensile strength for Rosenthal insulating porcelain H was fixed at 261 kg./cm.^{2} Berlin porcelain was completely impervious to gas at 1300°, vessels composed of it had maintained a pressure difference of 30 mm. of Hg. at 100°, collapsing at higher temp. while still gas-tight. Berlin porcelain with a strong yellow color contained 0.82% of Fe_2O_3 and 0.31% of TiO_2. Small amts. of MgO, and, still more of ZnO, favored a white color. A thin sheet of porcelain was found to possess high double refraction. The sp. resistance of porcelain (after eliminating surface cond., due to grease, etc.) was high, but it fell rapidly with increase of temp. Increase of feldspar content decreased the resistance while increase of clay materials at the expense of SiO_2 added to the resistance at higher temps. The dielec. const. was 5.73, but highly felspathic, soft porcelain gave higher values. The velocity of sound in porcelain was fixed at 4900–5200 m./sec. Electrically poor porcelain had poor cond. of sound. The relationship between the cond. of sound and mech. properties was not known. H. G. (*C. A.*)

109. Electrical porcelain. A. Schwaiger. *Elektrotechn. Z.*, **43**, 875–80(1922).—Limiting voltages are discussed. C. G. F. (*C. A.*)

PATENT

110. Pottery; pigments. A. J. Stubbs. Brit. 181,132, March 12, 1921. Discolored earthy minerals such as kaolin, barytes, feldspar, bauxite, etc., are decolorized by suspending the finely divided minerals in H_2O to which are added pieces of Pt, Fe, or Zn. SO_2 is then introduced and is reduced by catalytic action to hyposulfurous acid, liberating O, which renders the coloring substances sol. in the hyposulfurous solvent. The coloring substances can be pptd. by CaO or an alkali for use as pigments. The SO_2 may be prepd. by the action of H_2SO_4 on metallic Cu. (*C. A.*)

Art and Design

111. Yellow etching compound. L. Springer. *Sprechsaal*, **54**, 212, 225(1921); *J. Soc. Glass Tech.*, **5**, 61–2.—This substance is obtained by mixing Ag compds. with yellow ocher and grinding intimately with water or oil. The intensity of color produced varies with the Ag content of the compd. (except in the case of the sulfide, which is stated to give a deeper color) with the temp. of burning in, and with the nature of the glass decorated. Opinions vary as to the effect of the glass on the depth of color produced. Zsigmondy, by the use of Ag phosphate, concludes that the color is caused by the reduction of Ag compds. which enter the glass, the action being due to impurities such as C, S, FeO, or metallic Pb. In this case, glasses free from impurities would not be affected. S. has made two similar alk.-lime glasses, one with potash, the other with soda, both decolorized with Ni oxide and Se. When these are treated with the

etching compd. under the same conditions, the potash glass is scarcely colored, while the soda glass becomes fairly bright yellow. Careful mixing and application of the mixt. are found to eliminate the dirty, uneven effect usually obtained in the treatment of certain weakly colored window glasses and of carbon-yellow glasses. A very hard, highly siliceous soda-lime glass is observed to be very little affected by the etching compd., even when heated until it softened. To est. the proportion of Ag which enters the glass, the residue of a Ag chloride-ocher mixt. (25 : 100) is treated, after burning, with NH_3, and the Ag chloride is then re-pptd. Only about 20% of the Ag is recovered.

H. G. (*C. A.*)

Heavy Clay Products

112. Handling the finished products of industry. GRAHAM L. MONTGOMERY. *Chem. & Met. Eng.*, **27**, 731–3(1922).—The handling of brick in manuf. by mechanical handling equipment is a simple problem, because of uniformity and size of product. Why modern methods have not been used. Suggests methods based on experience of American Enameled Brick and Tile Co., in use of conveying equipment. Number of brick handled in a given time has been increased 20%. R. R. DANIELSON

113. The making and marketing of common brick. J. B. ROSE. *N. J. Ceramist*, 1 [3], 198(1921).—Presented at a meeting of the N. Y. Building Congress. Existing conditions in the trade are attributed to ignorance, lack of sympathetic coöperation and half-season work. 40% of the labor employed in the Hudson River district comes from the south. It is suggested that a commission should be appointed to make a survey and full report regarding the requirements of the market for the year. The rules of the Board of Education in N. Y. City prescribe that no brick may be laid when the thermometer shows a temp. below 32°F. The author objects to this restriction. There is need for a law guaranteeing the producer and the supplier of materials compensation for such when furnished for building purposes. The author is of the opinion that there is sufficient clay along the Hudson Valley to meet all the future requirements of the Metropolitan district. The supply of sand for the purpose is limited.

C. W. PARMELEE

114. The properties of some ball clays. H. H. SORTWELL. *The Ceramist*, **2** [1], 5–15(1922).—Some of the results of an investigation of domestic and foreign ball clays conducted by the Bureau of Standards. *Miscellaneous properties of ball clays.*—(See Table I.) The oxidation test was conducted by the means of draw trials 2 x $1^1/_4$ x $1^1/_4$, and heated to 750° in 5 hrs., and held at that point. American clays contain less material coarser than 120-mesh than English clays. The average moduli of rupture were:

Kentucky clays	282 pounds per sq. in.
Tennessee clays	366 pounds per sq. in.
Devonshire clays	443 pounds per sq. in.
Dorset clays	405 pounds per sq. in.
English clays (source unknown)	419 pounds per sq. in.

The clays were divided into three classes according to their color—Class 1, the best; Class 3, the poorest. Graphs show the burning conduct of the clays. English clays vitrified at low temp. and remained almost constant in porosity and volume to cone 12, without signs of overfiring. Amer. clays showed gradual reduction in porosity from cone 01 to cone 12 and constantly changing volume. With one exception they did not vitrify before cone 12. Tenn. clays vitrified before Ky. clays. Comparisons of color were made on test pieces of a standard body mixt.

TABLE I.—MISCELLANEOUS PROPERTIES OF BALL CLAYS

Lab. No.	Name of Clay	Water of plasticity	Vol. drying shr.	Shr. water	Pore water	Ratio pore water–shr. water	Density dried clay	Residue on 120-mesh	Hrs. oxidation at 750 °C	Mod. of rupture, 1 clay–1 flint
1	Knowles Eng. Ball Clay, No. 1	45.6	28.4	24.3	21.3	0.88	1.667	0.2	0.5	376
2	Knowles Eng. Ball Clay, No. 2	51.9	26.1	24.7	27.2	1.10	1.413	1.5	11.0	375
3	Knowles Eng. Ball Clay, No. 12	44.9	27.7	23.9	21.0	0.88	1.627	0.7	9.5	568
4	Whiteway Eng. Ball Clay	39.9	28.4	22.3	17.5	0.78	1.738	0.4	8.5	446
5	Eng. Ball Clay, No. 90	47.3	29.6	26.3	21.0	0.80	1.627	0.7	8.0	441
6	Pikes Ball Clay	46.3	32.2	27.9	18.4	0.66	1.742	0.2	4.5	381
7	Superior Ball Clay	46.4	28.2	24.6	21.8	0.89	1.598	1.2	11.0	563
8	Kentucky Ball Clay No. 4	46.7	28.1	24.7	21.8	0.88	1.593	0.1	3.5	372
9	Tenn. Ball Clay, No. 5	51.9	29.2	26.5	25.4	0.96	1.537	0.4	8.5	478
10	No. 25 Blue Ball Clay	48.3	33.5	29.5	18.8	0.64	1.712	0.9	2.5	403
11	Devon Ball Clay	44.3	26.5	21.9	21.4	0.98	1.652	0.4	2.0	345
12	Tenn. Ball Clay, No. 11	44.5	26.0	21.9	22.5	1.02	1.585	0.1	1.0	293
13	Dorset Ball Clay	45.9	33.0	28.1	17.8	0.64	1.753	0.1	1.0	492
14	Kentucky Ball Clay, No. 10	38.3	25.5	19.7	18.6	0.94	1.733	0.0	0.0	223
15	Eng. Ball Clay, No. 11	48.5	33.5	29.2	19.3	0.66	1.723	0.3	1.5	396
16	Fayles Ball Clay	47.0	32.7	28.3	18.7	0.66	1.714	0.8	2.0	347
17	Grindley Ball Clay	45.8	29.1	25.3	20.5	0.81	1.623	0.8	10.0	427
18	Great Beam Ball Clay	47.6	28.8	25.6	22.0	0.86	1.577	1.6	8.5	454
19	Kentucky Ball Clay, No. 9	41.5	27.0	22.1	19.4	0.88	1.671	0.0	0.0	253
20	Tenn. Ball Clay, No. 3	53.3	27.6	29.9	23.4	0.78	1.545	0.3	2.0	327
22	M. & M. Eng. Ball Clay	45.8	28.9	24.7	21.1	0.86	1.587	1.4	7.5	384

TABLE II.—COLORING EFFECT OF CLAYS IN STANDARD BODY

No.	Name of clay	Color of body	Class
1	Knowles Eng. Ball Clay No. 1	Very light buff	2
2	Knowles Eng. Ball Clay No. 2	White	1
3	Knowles Eng. Ball Clay No. 12	Light cream	1
4	Whiteway Eng. Ball Clay	Buff	3
5	English Ball Clay No. 90	Light buff	2
6	Pikes Ball Clay	Cream	2
7	Superior Ball Clay	Light buff	2
8	Kentucky Ball Clay No. 4	Cream	2
9	Tennessee Ball Clay No. 5	Light cream	1
10	No. 25 Blue Ball Clay	Light buff	3
11	Devon Ball Clay	Light buff	2
12	Tennessee Ball Clay No. 11	White	1
13	Dorset Ball Clay	Buff	3
14	Kentucky Ball Clay No. 10	Light buff	3
15	Eng. Ball Clay No. 11	Buff	3
16	Fayles Ball Clay	Buff	3
17	Grindley Ball Clay	Light buff	3
18	Great Beam Ball Clay	White	1
19	Kentucky Ball Clay No. 9	Light cream	1
20	Tennessee Ball Clay No. 3	Cream	2
22	M. & M. Eng. Ball Clay	Cream	2

(See Table II.) Class 1 includes those of the best color; Class 2, fair color; Class 3 poor color. American clays showed a good color. Tenn. clays were better color than Ky. The majority of Devonshire clays were in the second class; three of the four Dorset clays were in Class 3. American clays nearly equal the English in plasticity, they require more exact firing because of the variations in porosity and vol., with slight changes in ht. treatment, which is the reason for the difficulty observed in attempts to substitute Amer. for English clays. The more porous body obtained by substitution of Amer. clays is conducive to crazing. Successful substitution requires a little higher firing or readjustment of the flux content to produce the same degree of vitrification.

C. W. PARMELEE

115. Working wet lime clays. W. D. RICHARDSON. *The Clayworker*, **78**, 336–7 (1922).—Method of removing limestone pebbles in entirety described, then a résumé of results of various experiments is given as regards fineness of grinding, the temp. at which the ware is burned and the duration of the high fire to prevent mechanical destruction and pitting of burned ware. J. W. HEPPLEWHITE

116. The manufacture of silica-lime bricks. ANON. *Science et industrie* [March, 1922]; *Industrie chimique*, **9**, 360(1922).—Nearly all sands even those with 10–15% clay, are suitable. In the slaked lime process of manuf. the moistened mixt. is pressed and baked in autoclaves under a pressure of 8–10 kg. per sq. cm. A. P.-C. (*C. A.*)

Glass

117. Nuts in glass. ANON. *Glass Container*, **1** [12], 5–31(1922).—Descriptive article tracing the development of merchandising and extension of demand by packing nuts in glass containers. WM. M. CLARK

118. Bottle blowers "tip" builds park highway out of glass mountain. ANON. *Glass Container*, **1** [12], 11–26(1922).—For building a road in the Yellowstone National Park it was desirable to remove material from Obsidian Cliff, a mountain of natural glass. Powerful explosives were ineffectual in blasting away the mass. One of the engineers (a former glass blower) suggested heating the mountain and then spraying the mass with water to cause it to disintegrate. Log fires were maintained for $^3/_4$ mile along the base of the mountain for several days and then water was sprayed on and a tremendous explosion followed which loosened the entire face of the mountain and cleared the way for the road, also later the chunks of glass were found admirably adapted for road-building. WM. M. CLARK

119. The binary systems Na_2Sio_3–Na_2WO_4, K_2SiO_3–K_2WO_4 and Na_2WO_4–K_2WO_4. J. A. M. VAN LIEMPT. *Z. Anorg. Chem.*, **122**, 175(1922).—The binary system Na_2WO_4–Na_2SiO_4 has been investigated by Van Kloster (*Z. Anorg. Chem.* **69**, 154(1911)), who found that the fused salts were mutually soluble to a high degree. The present paper deals with viscosity and specific conductivity measurements of aqueous solns. of these salts to det. whether compds. were formed therein. No evidence of compd. formation was found in the series Na_2SiO_3–Na_2WO_4 or K_2SiO_3–K_2WO_4. E. W. TILLOTSON

120. Melting of glass. ANON. *Jour. Soc. Glass Tech.*, **6**, 3–17(1922).—General discussion at the Leeds Meeting, November 15, 1921. **Casing of opal on flint glass.**—The importance of exactitude and speed in covering the ball of flint with a uniform layer of the opal, and of having the two glasses match in expansion was pointed out (M. W. TRAVERS). With a softer covering glass, less accurate matching is required (W. E. S. TURNER). **Frequency of charging of batch into furnaces.**—It was agreed that *feeding of tank furnaces* at short intervals, 10 to 30 min., gave better quality of glass and meant a saving of fuel, provided the use of a dog house eliminated periodic cooling. With an open furnace and no bridge, large fillings seem to be better (J. ADAMSON). R. L. Frink prefers to add a charge of about one-fourth cullet and then to fill the batch

on top. In the case of *pot furnaces*, best results are obtained if the pot is filled with three successive equal charges (R. L. Frink). **Influence of saltcake on decolorizing action of selenium.**—W. E. S. Turner stated that while 1 to 2% produced no serious effect, laboratory experiments for 1 to 5 per cent showed that the decolorizing effect was certainly diminished. R. L. Frink has found that 1 to 2 per cent stabilized the color as well as being otherwise advantageous. The final color of the selenium glass depends also on the leering. **Dark spots in chromium green glass** are due to undissolved chromium oxide (J. H. Davidson). They may be prevented by grinding the oxide fine or by mixing it with two parts of bichromate (F. G. Clark). **Causes of secondary boil.**—This boil may be produced in a variety of ways, such as by a smoky gas flame depositing carbon on the surface (M. Asquith), by too great changes of temperature either cooling or heating after melting, by iron dropped in the glass, by the oxidation of carbon and sulphur coloring material, and by decomposition of small amounts of salt-cake (W. E. S. Turner). **Action of various analytical reagents on chemical glassware.** W. E. S. Turner and T. E. Wilson. *Jour. Soc. Glass Tech.*, **6**, 17–20(1922).—In continuation of previous researches, four glasses were tested with nitric acid (sp. gr. 1.2), 2 N-ammonium sulphide solution and sodium phosphate solutions (N/2 and N/4). For the first two solns. the loss in 90 min. at 100°C was only 3 to 5 mg. per 100 cm.², but the corrosion by the phosphate solution was somewhat greater, increasing with the concentration. This action seems not to be due merely to alkalinity, since one of the glasses is relatively much more corroded by the phosphate solutions and by 2 N-sodium carbonate solution than by N/10-caustic soda.

G. S. Fulcher

121. Polohalite. Anon. *Raw Materials Rev.*, **1**, 43(1922).—A mineral of great utility to the glass industry and for soap-making has been found in the valley of the Morelle River, Sicily. A dip has disclosed: Saline marle contg. gypsum, chloride of sodium 2 m., sulphates of various bases 14 m., sulphate and chloride of sodium 4 m., other sulphates of various bases, marle and gypsum in great masses. O. P. R. O.

122. Autoclave test for chemical glassware. Gaillie and Wilson. *Jour. Soc. Chem. Ind.* (London), **40**, 448R(1921).—Results from this test show a closer relationship between the degree of clouding and the amount of alkalinity. There was a considerable measure of concordance between the results obtained with the autoclave test and those obtained with the dimming test. There was a close relationship between the durability hardness and alumina content of these glasses. This investigation of the autoclave test was made primarily to test durability. O. P. R. O.

123. Glass discovery. Anon. *London Times Trade & Eng. Supp.*, **11**, 31(1922.)—The manuf. of glass and glassware is one of the oldest-established industries of Czecho-Slovakia. The new discovery is that of a silicate which is suitable for the production of raw glass without the aid of other ingredients. The mineral is of volcanic origin and as the deposits are very extensive they should provide the Czecho-Slovak glass industry with a cheap raw material. O. P. R. O.

124. Glass manufacture in Burma. Anon. *London Times Trade & Eng. Supp.*, **11**, 29(1922).—Burma possesses large quantities of raw materials for glassware. Despite the difficulties which face a pioneer industry of a highly technical kind, a native Burman has made such successful expts. that Burma has an established glass industry in the vicinity of Rangoon. O. P. R. O.

125. Glass powder. Anon. *Raw Materials Rev.*, **1**, 88(1922).—By rubbing the walls of a vessel with a glass rod, small particles of glass are rubbed off, which act as crystn. centers or coagulators. If the rubbing is continued for a time a deposit is obtained even in distilled water, meriting the attention of chemists. One can thus obtain glass

in suspension in the most various soln., the resistance of which by the addition of various substances can be increased, and small quantities of glass powder can be collected.

O. P. R. O.

126. Ruby glass. ANON. *Schnurpfeil's Rev. for Glass Works*, **6** [66], 1311(1922).—Copper ruby is one of the hardest colors to make and control. A simple batch is manganese with saltpeter or manganese in an opal base batch. In an opal batch use 2.5 MnO_2 for 100 of sand. The following batch colors out on reheating, sand 100, soda ash 40, borax 8, zinc oxide 10 to 12, selenium 1.25, cadmium sulphide 1.75. If zinc powder is used it will color in the furnace. Sulphur gives a fair ruby. Copper ruby is usually used in cased glass. The following batch colors out on annealing. Sand 100, soda ash 35, lead oxide 5, borax 3, lime 10, barytes 8, bone ash 0.5, red tartar 4, oxide of tin, 3, cuprous oxide 1.5. Phosphoric acid and barytes often aid coloring.

R. J. MONTGOMERY

127. Annealing and heat treatment of gauge glass. HENRY W. HESS. *Glass Worker*, **41** [53], 11(1922).—Gauge glass subject to sudden temp. changes should be uniformly strained and not well annealed. If local strain is introduced by cutting off or fusing the ends it may be made uniform by heating to about 1300°F and cooling rapidly and evenly in air. R. J. MONTGOMERY

128. To tarnish or etch glass surfaces. MARCEL AND ANDRÉ FICHTER. *Glass Worker*, **42** [5], 15(1922).—A French patent by M. and A. Fichter increases the working life of a hydrofluoric acid bath to 3 or 5 weeks and reduces the emission of vapor to almost nothing. Two baths are mixed separately and then put together in any propn. desired, as follows. Bath 1, + fluoride of sodium 5 gr., water 5 gr., sulphate of potash 1 gr.; bath 2, + chloride of zinc 2 gr., hydrochloric acid 3.5 gr., water 4.5 gr. Use the same as the old type of bath. R. J. MONTGOMERY

129. Natural constants and technical constants of glasses. E. ZSCHIMMER. *Z. Elektrochem*, **28**, 194–201(1922).—A lecture. Values of a no. of different consts. for various kinds of glass are compared and discussed. H. J. C. (*C. A.*)

130. The necessity for preheating air in furnace work. A. POPOFF. *Sprechsaal*, **54**, 496(1921).—A theoretical consideration of fuel saving by preheating the air used in a glass tank furnace. H. G. (*C. A.*)

131. Rubbing of glass walls with a glass rod. ROBERT FRICKE. *Z. Elektrochem.*, **28**, 244–5(1922).—Crystn. is promoted by rubbing the glass walls of a vessel with a glass rod, not by mech. shock as is often stated in text-books, but by the production of a fine glass powder the particles of which act as crystn. nuclei. H. J. C. (*C. A.*)

132. Comment on R. Fricke's communication "Rubbing the wall of a glass vessel with a glass rod." L. DEDE. *Z. Elektrochem.*, **28**, 364–5(1922); cf. preceding Abs.—It is claimed that the formation of crystals takes place more readily when the walls of a glass vessel are rubbed with a rubber-covered rod instead of a glass rod, and that the formation of crystals is probably due to electrostatic causes. Reply. R. FRICKE. *Ibid.*, 365–6. H. J. C. (*C. A.*)

133. Optical glass. Its properties and production. J. W. FRENCH. *Optician*, **59**, 335, 351; **60**, 3, 18, 28(1920); *J. Soc. Glass Tech.*, **5**, 112–3.—A brief account is given of the history of glass from the earliest times. The optical properties of glass are considered at length, the loss of light due to various causes playing a large part in the production of optical instruments. Important defects in optical glass are lack of isotropy and homogeneity, the former due to insufficient annealing and the latter to veins and striæ. The striæ are avoidable by finely grinding the batch constituents and thoroughly mixing them, and by keeping the fluid glass well stirred. Veins due to the solvent action of the glass on the pot and stirrer can best be minimized by suitably choosing the clays from which these are made. The devitrification of glass is fully

discussed. A curve shows the increase in durability of a soda-lime-silica series of glasses due to the increase of lime content. Glasses contg. less than 6% of lime are unstable on account of their defective durability, while if the percentage is greater than 17 (the silica content remaining at 70%) they are impracticable owing to melting difficulties and opalescence due to devitrification. A similar curve illustrates the decrease in durability of a series of flint glasses as the lead content increases. The building and drying of the pots are described and a short account is given of glass works furnaces. This is followed by a description of the actual melting process, special attention being directed to stirring. The molding into small pieces, inspection for defects, and annealing operations are briefly described. H. G. (*C. A.*)

134. Dispersion formulas and the secondary spectrum. T. Smith. *Trans. Optical Soc.*, **22**, 99(1920–21); *J. Soc. Glass Tech.*, **5**, 181–2.—From a study of the n's of many glasses the data being derived from the Jena glass lists, S. empirically deduces a formula by means of which n for any wave length, λ, can be calcd. from the relative dispersions. For a "normal" glass this formula is $n - n_D = [0.226(n_F - n_C) + 0.0062(n_D - 1)](\lambda^{-0.91} - \lambda^{-0.91}_D)/(\lambda^{-0.91}_F - \lambda^{-0.91}_C) + [0.774(n_F - n_C) - 0.0062(n_D - 1)](\lambda^{-3.4} - \lambda^{-3.4}_D)/(\lambda^{-3.4}_F - \lambda^{-3.4}_C)$. When a glass is not "normal" the actual n differs from that obtained by the formula. For wave lengths between C and F the correction is negligible, being of the order of 2×10^{-5}. In the case of the ends of the spectrum, the glasses which have to be corrected are more numerous and the corrections larger. Even here, however, few glasses have corrections larger than $\pm 6 \times 10^{-5}$. The formula, which differs only slightly from one previously advanced by Conrady, is further confirmed by application to Gifford's results. The bearing of the formula on the secondary spectrum of thin lenses was discussed. H. G. (*C. A.*)

135. Abrasives and polishing powders for glass. James W. French. *J. Oil Colour Chem. Assoc.*, **5**, 103–110(1922).—A review of the principles of abrasion and polishing, with photomicrographs of etched percussion cracks and scratches in polished glass, and of abrasives and polishing mediums. That polished glass consists of an amorphous surface layer, covering innumerable scratches which etching develops through removal of this surface layer, does not seem to be correct. The polishing process on glass consists of wearing away all parts of the surface to a common level, and not of the formation of an amorphous surface layer which bridges over cavities, as seems to be the case in certain polished metals studied by Beilby (*C. A.* **8**, 3750). Discussion. F. A. W. (*C. A.*)

136. Heat losses in glass manufacture and their control. Klaften. *Sprechsaal*, **54**, 251(1921); *J. Soc. Glass Tech.*, **5**, 140.—K. divides heat losses into 3 sections. The first section includes losses which are inevitable, such as heat used in the producer to convert solid to gaseous fuel, heat taken away by the ash, and heat lost by gas waste during reversal. In this class also are placed losses occurring at working and other openings in the furnaces. The second group contains losses which can be obviated or reduced, such as those caused by bad regulation of the producer (entailing premature burning of the gas or loss of unburnt fuel in the ash), and losses at poking holes where not carefully constructed. This section also includes heat losses caused by incomplete burning of the gas in the furnaces, due to incorrect air supply or to faulty design of burners, chambers, or flues. Another source of loss, the conduction and radiation of heat, can be minimized by the use of suitable insulating materials. In the third section are grouped losses which are not recoverable in one direction, but which can be made use of in other ways. Among these are included the use of heat from the generator for drying moist fuel, of heat from the waste gases for drying fuel or heating the room, and finally, of the use of heat lost by the furnace crown to warm the blast or secondary air. The following figures for the heat balance of a plant are given. Of every 100 cal. of

heat supplied 95.5 came from the producer and 4.5 from the steam. Useful heat for melting glass amounts to 12.5 cal., while 12 are recovered from waste gases. The heat losses are 15 cal. in the producer, 4 in the flues, 0.5 during reversal, 6 in the regenerators, 20 by conduction and radiation from the substructure, and 23 from the superstructure, 7 lost in chimney waste gases and radiation from the brickwork.

H. G. (*C. A.*)

137. The structure of abraded glass surfaces. F. W. PRESTON. *Trans. Optical Soc.*, **23**, 141–64(1922); *Naturwissenschaften*, **10**, 517–9.—A study of the physics of ground and polished glass surfaces. The object is to substitute the conception of a flaw or fissure complex for the current view of a hill and hollow structure. The enhanced soly. of ground surfaces in HF is shown, and from this soly. is estd. the thickness of the flowed or surface tension layer. The grains of abrasive are dragged over the surface, producing chatter and diamond cuts, percussion flaws, cascade cuts and intermediate forms. The hills and hollows do not represent the full depth of fractured layer, for below is 2–3 times the depth of flaws. French (*Trans. Optical Soc.*, Nov., 1916) contended that there is a flowed (*"beta"*) layer approx. 8 wave lengths deep. By etching with HF and detg. the rate of soln. for the surface layer and for that below the crit. depth, P. attempted to confirm or disprove this. A comparison of a disk-cut surface with a grayed surface showed that HF attacked the former only 0.3 as fast as the latter. A grayed surface was attacked 11 times as quickly as a polished one. The rapidity of HF attack on a grayed surface quickly decreased, becoming the same as that on a polished one. The rate of attack on the polished surface remained const. It is concluded that if there is a *"beta"* layer 8 λ deep, it does not differ in soly. from the massive *"alpha"* material. The high initial rates on grayed surfaces can be due either to a surface area 10–12 times that of the polished apparent surface or to the surface material differing radically from the massive. From the Twyman effect it is shown that the surface is under excessive strain. It is, therefore, judged that both effects are present, an increased area due to chatter-flaws and an enhanced soly. due to strain. It is shown by etch patterns that there is a detail of a few millionths of an in., and this could not exist in a flawed surface tension layer. So if glass has a flowed layer it is only 2–3 millionths in. thick. Feldspar and quartz were much more resistant to HF than glass. The structure of glass was developed in 15 sec. in 2 *N* HF at 15°, whereas feldspar required 5 min. and quartz 7 min. with 5 *N* HF. Etching of apatite and fluorite with H_2SO_4 suggested a certain plasticity of their crystals. C. C. D. (*C. A.*)

138. Grease for molds. ANON. *Sprechsaal*, **54**, 6, 67(1921); *J. Soc. Glass Tech.*, **5**, 103–4.—The following formulas for grease for molds in which goblets are blown give a high brilliancy to the glass, and also resist dislodgment by water into which the mold is dipped. (1) A mixt. of very finely ground pure charcoal with resin is spread over the mold by a gathering of hot glass. (2) The mold is warmed and coated, not too thickly, with linseed oil or thick varnish. Charcoal, very finely ground and sieved (preferably through coarse canvas), is then uniformly spread over by a sieve. (3) Equal parts of varnish and resin are melted together for 1–2 hrs. and, on cooling, a third of red lead is added. After coating the mold evenly and spreading with fine charcoal, it is heated in the furnace or allowed to stand for $2^1/_2$ hrs. H. G. (*C. A.*)

139. The chromate-albumin copying process as an etching basis for glass, etc. C. FLECK. *Sprechsaal*, **54**, 340(1921); *J. Soc. Glass Tech.*, **5**, 126–7.—The soln. for coating the glass consists of: distd. water, 1000 cc.; NH_3 (sp. gr. 0.960), 20 cc.; albumin, 50 g.; $(NH_4)_2Cr_2O_7$, 7 g. The results are satisfactory only when distd. water is used. For the prepn. of the soln., the best method is to dissolve the albumin in 275 cc. of water, beat up, and run in the soln. of dichromate in the rest of the water, shaking together, and then filtering carefully through a cotton-wool wad. The plate to be etched is cleaned

by rubbing with the following mixt.: sieved whiting or powd. charcoal, 20 g.; NaOH, 2 g.; water, 50 cc alc., 50 cc. After cleaning and washing off all solid grains from both sides of the plate, the clean surface is covered with the albumin soln., excess being drained off. Drying is performed in an app. for rotation over a hot iron plate; care is needed not to prolong the heating unduly, otherwise coagulation of the albumin results. The pattern is printed on the prepd. plate from the negative in a copying frame, time of exposure being one to two min. in summer sunlight, two to three min. in the winter sun, and ten times as long in diffused light (too great exposure hardens the prepn. and prevents the absorption of color). The colors applied are generally printing colors, often thinned down with lavender oil.' Such a color can be made as follows: rectified turpentine, 50 cc.; powd. Syrian asphalt, 10 g.; good illustration color, 40 g. The above can be melted together and filtered into a box or bottle. Colors which contain wax or tallow do not give sharp copies, and, if applied to designs with fine, close lines, they give a confused result on burning in. The color is applied by evenly rolling into the plate, and the pattern then developed by laying the plate in water and washing with a soft sponge or pad, using a rotatory motion. After washing with water, the plate is dried in the app. for rotation and fine asphalt powder is shaken over it; the surface is dusted with a wad, freed from the last traces of dust with talc and a powder puff, and the design burnt in. Everything outside the copy is covered with shellac, which was dried. Finally, the design is etched with a strong etching soln., so that, after etching, little color distinction remains, and a relief is obtained which can be felt when rubbed over.

H. G. (*C. A.*)

140. Modern glass factory equipment. W. S. Mayers. *Glass Ind.*, **3**, 197–9 1922.—A discussion of the *fan system of air cooling.* J. B. P. (*C. A.*)

PATENTS

141. Furnace. F. O'Neill. Brit. Pat. 179,977, Jan. 12, 1921. Ill. Off. Jour. Pats., July 12, 1922. Describes arrangement for delivering uniform charges of molten glass from a tank furnace. Sketches of mech. details. Wm. M. Clark

142. Crucible furnaces for manufacturing glass. Kosuke Hirano. Japan, 39,936, Sept. 14, 1921. Addition to 35,365. Diagrammatical description. (*C. A.*)

143. Apparatus for testing glass containers. O. C. K. Hutchinson. U. S. 1,427,817, Sept. 5. Glass bottles or the like are carried on a conveyor between electrodes which subject them to a spark to detect pin holes or cracks. (*C. A.*)

Enamel

144. Standardization of enameled apparatus for chemical purposes. Emerson P. Poste. *Chem. & Met. Eng.*, **27**, 1016–19(1922).—A paper presented at 8th Chem. Exposition, on Ceramic Day, Sept. 15, 1922. Describes standardization as regards types of enamels to withstand varying degrees of corrosive action, materials of construction, uses, and methods of temp. control on app. R. R. Danielson

145. Growth of cast iron. (From report by Tario Kikuta, *Jap. Iron & Steel Inst.*) *Chem. & Met.*, **27**, 510(1922).—Growth of cast iron in heating is attributed to two different causes; (1) internal oxidation, (2) expansion of occluded gases. K. measured the leakage of gases through a gray cast iron tube at room temp. and at 960°C. Leakage at high temp. was only slightly less. It is therefore improbable that air enters at low temp. and cannot escape at high temp. Tests in vacuo show that growth is not due to oxidation. K. concludes that growth is due to decomposition of cementite and to formation of minute fissures caused by differential expansion of various micro portions.

R. R. D.

PATENT

146. Enameling. L. DE RAPHÉLIS-SOISSAN. Brit. 982,788, July 3, 1922. To support and fix the enamel powder on metal the articles are coated with a porous non-carbonizing substance such as asbestos, mica, pumice stone, or infusorial earth, in powder, fiber, or sheet form, and the enamel is painted thereon or may be previously incorporated therewith. The articles are then shaped and fired. (*C. A.*)

Cement, Lime and Plaster

147. Gypsum withstands fire. ANON. *Contract Record*, **36**, 961(1922).—Expts. at Chatham, Ontario, Canada, demonstrated the effectiveness of gypsum as a fire resisting material. A building was erected by the Ontario Gypsum Co., at Chatham, with gypsum board on wood studding; this was filled with dry hay, wood, oil and other combustible materials and set on fire. The heat was terrific but the fire was allowed to follow its own course and after it died away a stream of water from a fire hose was turned upon it. Outside of being blackened and stained by smoke, the house was uninjured and examination showed that the studding and frame work beneath the gypsum board were uncharred and in as good condition as when first erected.

O. P. R. O.

148. Lime bricks. HENRI SERVANGE. *Raw Materials Rev.*, **1**, 88(1922). France claims to have produced lime-bricks from raw chalk of limestone waste and clay or sand, by mixing sand or clay in any propn. with chalk and pressing the product wet. The pressed goods are heated in a brick kiln to an easy red glow, 500° to 550° C, which corresponds to the temp. of the decompn. of slaked lime. At the same time the atm. in the kiln is kept moist by forcing steam into it, in order to obviate the complete desiccation of the bricks. The too rapid escape of the carbonic acid must be prevented by the use of proper slides, as its presence is indispensable for hardening the monocalcium-hydrosilicate. After a few hours of this treatment, the bricks will have become exceedingly hard when they can be removed from the kiln. O. P. R. O.

149. Structural materials tested. HYDRO-ELEC. POWER COMM. OF ONTARIO. *Annual Report*, p. 275, 1921–22.—The activities of the structural materials lab. may be classified into 3 divisions: cement testing; concrete testing; and testing of miscellaneous structural materials. To this might be added coöperative activities in conjunction with national organizations, such as the Canadian Eng. Standards Assoc., in carrying out technical investigations and in the preparations of specifications. A considerable decrease in the cost of testing and inspection is the result of the research work carried on in the laboratory of the Hydro-Electric Power Commission. O. P. R. O.

150. Fuel and cement kilns. ANON. *Times Trade Supp.* (London), **11**, 19 (1922).—The research into rotary kilns for cement burning made by the British Portland Cement Assoc. on a £ to £ grant from the Dept. has given results that are already incorporated in the practice of cement works, and show a saving of 4 to 5% of coal and an increased output of ten per cent of cement. One firm alone is saving £25,000 a year in its fuel bill as it was before the Armistice. O. P. R. O.

151. New system of concrete construction. ANON. *Canadian Engineer*, **43**, 413(1922).—Concrete houses are now being constructed in Gr. Br. by a new method known as the "Wilkielock," system which consists of making the outer walls of clinker concrete slabs, $2^1/_4$" thick, faced with $^3/_4$" cement mortar, a $4^1/_2$" space being left, while the inner slabs are made of coke breeze and cement, also $2^1/_4$" thick. The result, it is stated, is that warmth is obtained without condensation. O. P. R. O.

152. Anhydrite as building material. ANON. *Raw Materials Rev.*, **1**, 180(1922).—"Chemiker Aeitung" states that the large beds of anhydrite in the Hartz could be utilized

by grinding the decomposed product with small additions of 3.5% of lime, and the result would be a building material that could be used for walls, ceilings, floors, and artificial stone, etc. Like any gypsum, it must not be exposed to continuous wet without protection. The tests of the Prussian Geol. Land Bur. also confirm the applicability of anhydrite. O. P. R. O.

153. Sand-lime bricks. H. O. Weller. *Dept. of Scientific & Industrial Research.* Building Research Board. London (1921).—"Mortar bricks" were made by an Englishman above 80 years ago; they were a mixture of sand and lime, hardened in the air; which process took from 6 to 18 months, developing a very small amount of calcium silicate. As a result of subsequent improvements Michaelis of Berlin took out his master-patents for true sand-lime (calcium-silicate) brick 40 years ago; his process, modified, is now exclusively used. Any clean siliceous sand, from quarry, pit or river, may be used; many other refractory and waste materials or by-products, such as slag, clinker, shale, quarry-waste, shards, etc., are suitable. The only other necessary material is lime. O. P. R. O.

154. Thermochemistry of (cement) vertical kilns. J. B. *Rev. Mat. Constr. Trav. Pub.*, **156**, 169–172(1922).—In burning materials for cement the following reactions take place, (*a*) fuel is burned to give CO_2, H_2O and SO_2. (*b*) carbonates of calcium and magnesium are decomposed to their oxides and CO_2. (*c*) in some calcareous materials org. matter and sulphur burn. (*d*) lime reacts with silica and alumina, the mass undergoing incipient fusion. It is known that reactions (*a*) and (*c*) produce heat, and that (*b*) absorbs heat. Berthelot and Le Chatelier maintain that reaction (*d*) is exothermic, while Timm states that it is slightly endothermic, and Stanger and Blount that the evolution of heat is practically negligible. A numerical example is given accounting for all the heat put into the furnace, heat absorbed and heat lost.

Louis Navias

155. Gyratory crushers. G. C. *Rev. Mat. Constr. Trav. Pub.*, **156**, 175–9(1922). —A tech. description of the parts of the "Atlas" gyratory crusher. (With 4 cuts.)

Louis Navias

156. Effects of alkali on concrete in prairie provinces. T. Thorvaldson. *Contract Record*, **36**, 953(1922).—The problem of the so-called action of alkali on concrete is generally considered to be peculiar to the prairie provinces of Canada and the corresponding States in U. S. The result of the low rainfall and poor drainage is the cause for presence in the soil of a large amount of sol. salts. Analyses of waters from the 3 provinces show that the dissolved salts are, in general, mainly sodium, magnesium, and calcium sulphates, with occasionally a large quantity of common salt. Until lately all failures of concrete were attributed to defects in the cement or concrete. Failures of some concrete structures exposed to sea water were considered by some as due to the salts. Of late it has been the general opinion in Great Britain that well-made constructions of dense concrete will stand up indefinitely when immersed in the sea but well-made concrete manufd. from the best materials will not stand up long if in contact with certain ground waters. Experiments on the preparation of concrete using water containing a high concentration of alkali salts indicate that the early development of strength through hydration is not interfered with. Cement briquettes will develop nearly full strength when cured in sulphate solutions of a concentration which later causes disintegration. Thus the alkali disintegration seems to be so slow in its action that the effect on the fairly rapid process of hydration is not noticeable. It is, therefore, likely that the action of the alkali is on the products of hydration of the chemical compounds in cement clinker. The free lime produced during the hydration of the calcium silicates in the cement has a slight solubility in water. On account of the low solubility and the consequent tendency to attain equilibrium in a thin film of

liquid on the surface, the extraction of hydrated lime from cement by pure water is slow. However, fair-sized crystals of hydrated lime may form on the surface of briquettes stored in distilled water. This leaching out of hydrated lime progresses most rapidly in the case of cements high in tricalcium silicate, while cements in which dicalcium silicate largely predominates are not so active. This statement holds in practice for specimens of equal permeability to water, and since dicalcium silicate after setting is much more porous than tricalcium silicate this advantage of the lower silicate disappears in practice. If bicarbonates or carbonates are present in the water these react with the hydrated lime forming insoluble calcium carbonate which may form a protection against further removal of lime and a partial protection against the action of sulphates from the outside. However, this protection is usually quite inefficient, at best, delaying the sulphate action somewhat. When sulphates are present in the water, in contact with the concrete, the conditions are entirely changed. The calcium of the hydrated lime reacts with the sulphate radical and calcium sulphate is formed. The solubility product for this substance is low, and the presence of a large concentration of the sulphate ion will therefore render it almost insoluble. It separates out of solution as the hydrated form of gypsum. The removal of the calcium from solution in this manner upsets the equilibrium between the dissolved and solid hydrated lime and speeds up the leaching out of this substance from the cement, while the moment it enters solution the calcium continues to be precipitated as gypsum. If the sulphate present is sodium sulphate, the liquid attains caustic alkalinity, while the sulphate disappears as gypsum into the solid phase. On the other hand, if magnesium salts are present as well as the sulphate, the hydroxyl ion is removed neutral, while both the magnesium and the sulphate radicals disappear from the solution and enter the solid phase. Thus the presence of dissolved magnesium salts and sulphates in water which is in contact with cement or concrete, produces ideal conditions for the constant removal of lime from the lime silicates in the cement, with the consequent weakening of the concrete and when carried to completion final loss of all cementing properties. The theory that the disintegration is due to the physical forces exerted during the crystallization of gypsum in the voids in the concrete can hardly stand as a sole explanation. It, no doubt, contributes to the final results by causing fissures in the weakened concrete and thus facilitating the access of the harmful sulphate waters to the interior portions of the concrete. At present the only remedy known is the manuf. of concrete of low permeability and high strength and this is only an expedient for lengthening the life of the structure.

O. P. R. O.

157. Fundamental physical and chemical properties of commercial lime. I. The available lime content. M. E. Holmes and G. J. Fink. *Chem. Met. Eng.*, **27**, 347–9 (1922).—Quick-lime and hydrated lime are defined and the line of investigation to be followed in the series of papers on this subject indicated. Titrametric methods of detg. the available CaO are described and the available CaO % on non-volatile basis is shown to equal: (% available CaO in samples as used)/(100 — loss on ignition). Tables show the available CaO content of typical Ca quicklimes in their corresponding hydrates and similar data on typical Mg limes. The tables emphasize a great variation in the available CaO content. The tendency is to have a higher available lime content than the corresponding hydrates as detd. by the A. S. T. M. method. Data show that it is possible to hydrate so as greatly to minimize this tendency. Reduction in the available CaO content during mech. hydration and mech. treatment may be due to mod. aggregation whereby a portion of the CaO is rendered physically unavailable or due to mole transformation by local burning during hydration converting some of the CaO into a less sol. form. The state of moisture and local temps. in the hydrator may cause chem. reactions tending to produce a small percentage of an insol. product

W. H. R. (*C. A.*)

158. Thermal conductivity of white marble and "Neat" cement. Roy A. Nelson. *Phys. Rev.*, **18**, 113–5(1921).—Thermal conductivity of "Alabama White" marble and of "Neat" cement was measured by the cylinder method at the following temps.: 50° to 100°, 100° to 150° and 150° to 200°. For marble the values 0.00614, 0.00524, and 0.00415 and for "Neat" cement 0.0014, 0.00165, and 0.00146 were obtained. The marble was principally $CaCO_3$ with a small amount of $MgCO_3$. The "Neat" cement was made of Portland cement and water. D. MacR. (*C. A.*)

159. Heat efficiency increase in cement burning. H. Larmour and W. C. Stevenson. *Concrete* (Cement Mill Section), **19**, 95–6(1921).—L. and S. submit the design of a proposed preheating bin for raw mixts. The bin is placed at the upper end of the cement kiln and all raw mix entering the kiln receives a preliminary heating in the bin, from the kiln gases on their way to the stack. The bin is fitted with 36 vertical tubes, 16 ft. long and 10 in. in diam. Such an installation should increase the output of the kiln, recover some of the dust ordinarily lost, and reduce the fuel cost per barrel of cement by 24%. J. C. W. (*C. A.*)

160. Kiln efficiency discussed. C. O. Sandstrum. *Concrete* (Cement Mill Section), **20**, 48–9(1922).—**Heat efficiency increase in cement burning.** C. E. Burgoon. *Ibid.*, 77.—Discussions of the paper by Larmour and Stevenson (cf. preceding abstr.). J. C. W. (*C. A.*)

161. The measurement of the temperature of rotary cement kilns. R. Nacken and G. Schoppe. *Zement*, **10**, 581–4, 595–7(1921); *Chimie et industrie*, **7**, 1149(1922).—The temps. were measured by means of Pt-Rh couples placed at 6-m. intervals in the shell of a 60 m. by 3 m. kiln. The results are plotted with the revolutions of the kiln as abscissas and the temps. observed at 60° intervals as ordinates. At 10 m. from the mouth of the kiln the av. temp. of the material was 50°. At 24 m. there is already a difference between the temp. of the clinker (K) and that of the gases (G). If the kiln is turning counter-clockwise, the max. temp. for each revolution is at a point 60° to the left of the lowest point, while the min. is at points 60–120° to the right of the lowest point. The av. temps. are $K = 350°$ and $G = 450°$. At 37 m. $K = 930°$, $G = 1060°$. The dissociation of $CaCO_3$ is hardly beginning, as it takes place at a higher temp. in an atm. rich in CO_2. At 45 m. $K = 969°$, $G = 1290°$. The lower value of K is due to the decompn. of $CaCO_3$, which requires 42.5 cal. per kg.-mol. of $CaCO_3$. At 48 m., *i. e.*, 3 m. back of the zone where the lime is burned, $K = 1255°$, $G = 1295°$. At 50 m. they are 1310° and 1345°, resp. G reaches a max. of 1430° at a distance of 52 m., but G does not rise as much (1360°) owing to the absorption of heat by the partial fusion of the clinker. At 54 m. G falls to 1410° while K remains practically the same. The burning is almost complete at a distance of 56 m. A. P.-C. (*C. A.*)

162. Defects in the manufacture of Portland cement, and their causes. A. Heiser. *Tonind. Ztg.*, **46**, 63–4, 79–81(1922); *Chimie et industrie*, **8**, 613(1922).—In one instance, owing to a leak in the H_2SO_4 app., CO_2 escaped, and deficiency of $CaCO_3$ was found. An excess of $CaCO_3$ was added, which gave an expansive cement. Another plant using the dry process and a rotary kiln turned out expansive cement owing to an excess of 1% of $CaCO_3$. In the case of a cement which set in barely 15 mins., the addition of 1% of plaster made it set in several hours. With respect to the spontaneous transformation of slow-setting into quick-setting cement, H. advizes mixing slow-setting cement in silos contg. large quantities of cement which have already undergone the transformation; also, increase the lime content, thoroughly moisten the clinker, add the max. amt. of plaster, and do not grind too fine. All the above mentioned cases of expansion were due to the presence of free lime. A. P.-C. (*C. A.*)

163. Cement industry in China. J. M. Clements. *Concrete* (Cement Mill Section), **21**, 44–7(1922).—An account is given of the 5 cement plants in China. J. C. W. (*C. A.*)

164. Increasing the resistance of cement to sea water by the addition of trass. A. Hambloch. *Zement*, **11**, 53–4(1922); *Chimie et industrie*, **8**, 614(1922).—Grün (*Ceram. Abs.*, **1** [8], 219) advises the addn. of pulverized sand instead of trass (to blast-furnace-slag cements) as the sand would give the same results and cost less than the trass. There are other factors which affect the compactness of the cements exposed to the action of sea water, and more particularly colloidal action, which is entirely lacking in sand. Moreover, trass has a chem. action in the hardening of concrete owing to the combination of the Al_2O_3, the CaO and the alkalies with the sol. SiO_2 under the action of the hydrosilicates, which action is comparable to the zeolitic phenomena observed in nature.
A. P.-C. (*C. A.*)

165. Change in volume of Portland cement and of concrete. Anon. *Zement*, **11**, 27–9(1922); *Chimie et industrie*, **8**, 613(1922).—The av. heat expansion coeff. of concrete is 0.00055% per degree F. Its expansion under the action of moisture may be 100 to 500 times as great. When a bar of cement is taken out of water it gradually contracts for 60 days. When put back in water it undergoes considerable expansion during the first week, and much less during the following weeks; the total elongation is 0.15%. Neat-cement bars were observed during 6 years. During the last years they were subjected to 4 periods of moistening and desiccation; the same variations occurred each time, and at the end of 6 yrs. the elongation was 0.08% greater than at the end of 3 yrs. the expansion and contraction can be regulated by adjusting the conditions of moistening and desiccation. These facts are explained by Michaelis' colloidal theory of the setting of cements. To test the effects of atm. humidity, the cement bars, after complete drying, were subjected at room temp. to an atm. satd. with moisture. After 3 months' expansion was 0.10%. Analogous expts. with hot water gave practically the same results as cold water.
A. P.-C. (*C. A.*)

166. Utilization of waste heat from rotary cement kilns. Joseph Brobston. *Mech. Eng.*, **44**, 517–8(1922).—Examples are given of waste heat boilers installed in cement plants, showing a reduction from 30 to 40% of the coal consumption.
L. A. P. (*C. A.*)

167. The testing of trass. Anon. *Tonind. Ztg.*, **46**, 90–2(1922); *Chimie et industrie*, **8**, 614(1922).—"Trass" is defined as finely ground waste from volcanic tuff quarries, of such nature that when mixed with $Ca(OH)_2$ it can set either in air or under water. The official German specifications and methods of testing are given.
A. P.-C. (*C. A.*)

168. The dispersoid chemistry of gypsum. II. Research on anhydrite. H. Neugebauer. *Kolloid-Z.*, **31**, 40–5(1922).—There are 3 forms of water-free $CaSO_4$; estrich gypsum formed by drying at 800° (it will set in water), dead-burned gypsum, and sol. anhydrite. The 3rd variety is formed by heating at about 100° under atm. pressure. It always contains as much as 4% of water. The rate of hydration of these forms was tested by measuring the viscosity of 3% suspensions at short intervals. Some com. prepns. of anhydrite show a rapid increase in viscosity indicating rapid hydration.
F. E. B. (*C. A.*)

169. High-strength cements. Jean Hendrickx. *Chimie et industrie*, **8**, 296–304 (1922).—The quality of artificial cement depends mainly on its physico-chem. compn., burning and cooling, and fineness of grinding. H. proposed (*Le Ciment*, 1920) the following compn. formula: $x SiO_2.2.5CaO + y Al_2O_3.3CaO + z Fe_2O_3.3CaO$ (by wt., not equivs.), and $SiO_2/(Al_2O_3 + Fe_2O_3) < 2.5$ and > 1.8. The latter is called the "SiO_2 modulus." By using more CaO than is given by the max. of the formula there is no great increase in strength, but danger of swelling. By using less than the min. the strength falls off. The following method (*Le Ciment*, 1920) is proposed for detg. the "burning quality." One g. of the mixt. is partially burned under standard conditions,

and the residue insol. in acids and alkalies is detd. with a compn. agreeing with the above formula, if the residue does not exceed 7.5% the "burning quality" is satisfactory. A lower limit (generally about 6%) can be readily fixed when SiO_2 must be added to raise the SiO_2 modulus. In order to det. if possible the reason of abnormally high strengths which are occasionally encountered, H. undertook a series of researches comprising: (1) chem. and spectroscopic analyses; (2) petrographic investigation of crystn. and clinkering; (3) physical tests in connection with fineness of grinding. Considerable work remains to be done, but some interesting results have already been obtained. (1) No trace of Be could be detected, but Ti is probably present. (2) Examn. of thin sections of two samples taken from the same batch of fused aluminous cement which had been differently cooled seems to show that this cement is a mixt. of silicates and aluminates and does not consist of aluminates crystd. in an Fe silicate as was believed at first. The examn. of 6 samples taken from a kiln under different conditions of burning and cooling showed that slow burning gives as good results as quick burning, provided that in the first case the clinker is cooled in water, while in the second case it should be cooled slowly. Two kinds of crystals are distinctly visible under the microscope, polarizing and non-polarizing; the latter seem to be more important as far as quick setting and high initial strength are concerned. (3) The amt. of residue which does not pass a standard sieve is not a criterion of the abs. fineness. The method and time of grinding and the sp. hardness of the material affect the abs. fineness, even when the sieve test gives the same results. The wt. of a 1. of the pulverized material, as generally detd. in the lab., decreases rapidly with the degree of fineness, while the sp. gr. as detd. by the LeChatelier-Candlot volumenometer remains practically const. The ratio (sp. gr.)/(wt. per 1.) is called the "modulus of fineness" and is used as a measure of abs. fineness. Tests carried out on 100 samples ground in a small Alsing mill and having practically all the same residue on a 4,900 mesh (presumably per $cm.^2$) sieve, and on 50 samples ground industrially, showed that the higher the modulus of fineness the better the quality of the cement, that with a modulus below 2.6 cements with high initial strength cannot be normally obtained, and that the modulus of fineness does not have the same effect on all cements, thus showing the importance of the crystalline form. A. P.-C. (*C. A.*)

BOOK REVIEWS

NOTE.—Under this heading we will give analytical reviews of those books which will be practical additions to the library of the manufacturer, practical potter, ceramic decorator and student. A publisher's announcement rarely describes a work from a pottery man's point of view, and as a result it is no simple task for the latter to select and find just those books which will furnish essential data (if such exists) covering some phase of his particular activity. If a book is of general interest only, or if it specializes on some particular type or branch of the work, such facts will be presented for the consideration of those interested.

Creative Impulse in Industry. HELEN MAROT. E. P. Dutton Company. 3rd. printing. 1919. $1.50.

A survey of industrial conditions made for the Bureau of Educational Experiments. Apparently written during the War with the intent to find a way not only to increase industrial efficiency in this country, but to do this with the interested coöperation of the workers.

The author's point of view is at once apparent in the following abstracted statement:

"All productive force is artificially sustained which is not dependent on men's desire to do creative work."

If there is a business in the United States that needs increased efficiency, it is that of the clay worker, and any sincere and authoritative attempt to show how this can be

done should surely be investigated. The manufacturers in the clay industries will read this book with mixed feelings, because it is probably the strongest indictment of the prevalent organization attitude towards the workers, that has yet been written.

The progressive organization official has followed the researches of Taylor and other efficiency engineers and has, as far as conditions will allow, adopted policies which at least prove their superiority over the previous grossly inefficient custom (for it cannot be called a system), where ignorant, incapable, disinterested and unreliable persons are put in charge of important industrial activities and placed in positions of authority over large numbers of people.

But, however much the human interest may be lacking in an organization, a system which will result in doubling production without an increase in cost is twice as efficient as the system that it superseded. This much must be accepted or one cannot read Miss Marot's book without a feeling of impatience and, finally, resentment.

Frederick W. Taylor has at least succeeded in convincing the large manufacturer of the importance of efficient shop operation, and it may be added that this was not done by means of literary reviews, but by years of active demonstration in some of the largest industries in this country.

If Taylor's "Principles of Scientific Management" and Miss Marot's book were side by side in a book store and superficially examined by an interested executive, we know which one he would purchase and carry away. It would not be "Creative Impulse in Industry." But this does not mean that this book is less valuable than Taylor's, or that it should not be in the possession of everyone concerned with production of every character.

Few industrial authorities will disagree with Miss Marot's conclusions. In fact, they are already accepted by a number of large manufacturers. Everybody knows that an interested worker is likely to be more efficient than a disinterested worker, and that an organization of interested workers is infinitely more productive than a disorganized, disgruntled organization. For obvious reasons, even the most conservative manufacturers are giving some attention to the social, educational and industrial conditions among the working classes as they exist today. But there are so many inimical conditions to a rational and business-like program as presented by Miss Marot, that it is quite definite that from twenty-five to thirty years will elapse before any educational movement in the direction of increased efficiency is generally tolerated.

The Unions will fight to the last ditch any activity that tends towards either making the worker satisfied or interested in his job. The workman must be discontented and he must be inefficient, or he cannot be a Union member in good standing. It is only necessary to take notice of the present sanitary ware strike. Here is a case where the unions compel the worker to limit the production to the point where anything like a reasonable productive efficiency is impossible. Various authorities agree that we must give speedy attention to the problems of industrial training. In fact, we are already doing this. But as stated, it will be at least two generations before we will have a condition where the labor element of the country is interested enough in creative or productive effort to have the desire to be efficient. However, there is no doubt that such books as this will contribute to bring about such a desirable condition.

Chinese Ceramics. J. J. Marquet De Vasselot and M. J. Ballot. (Published by Albert Morance. Paris. 1922.) Brentano's, New York. 2 vol., $18.50.

Two compact folios, 9″ x 7″, containing eighty odd lithographic reproductions of Chinese vases in the Louvre Museum. Most of the plates are in color. The first volume deals with the Han-Ming periods (206 B. C. to 1643), and the second follows the K'ang Hsi, Yung Cheng, and Ch'ien Lung periods and on to the present day (1662 to 1911).

Interesting and authoritative historical reviews accompany each volume. There are also reproductions of marks, and a short list of works of reference.

While the most noticeable omissions in this collection are those of examples of some of the finer figures of the Han period, and the monochromes of the K'ang Hsi period, the collection as shown is fairly representative, and the work as a whole is a notable addition to existing works on Chinese ceramics.

The first volume is particularly interesting, and the plates of the Ming polychrome figures and vases are beautifully reproduced.

The value of such a work as a reference for the American collector is obvious, but it possesses yet far more practical value for the manufacturer of art wares, the modeler, the ceramic engineer and decorator.

PLATE LXIX.

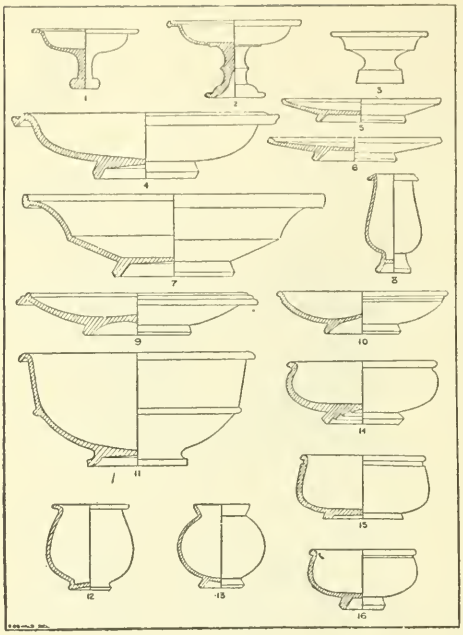
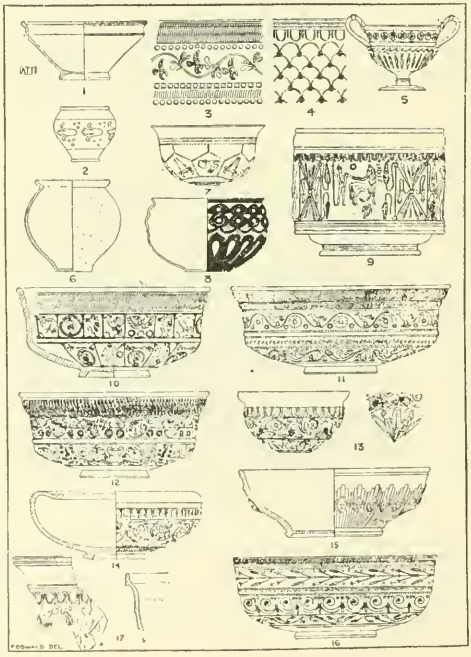


PLATE XXVIII



An Introduction to the Study of Terra Sigillata. FELIX OSWALD AND T. DAVIES PRYCE. Published by Longmans, Green and Co., New York City. 1920. $16.50.

A profusely illustrated study of the "Terra Sigillata" or more commonly known "Samain" ware.

A general description of the Italian Sigillata (Arretine Ware), and the provincial Sigillata is given, and the various developments are chronologically treated.

There is quite a complete bibliography, and the eighty-five carefully drawn plates show some fifteen hundred ceramic forms and decorative details.

The book is a comprehensive and scholarly archaeological study, and it will find its place in the various libraries as such. But we are concerned with its value to the potter, for here is a wealth of material and information such as the art potter, terra cotta and faience manufacturer have been looking for, for many a day.

There is page after page showing decorative treatments, motifs, and shapes developed during the various periods in which these were produced. The latter part of the work is devoted almost entirely to shape construction drawings which will be particularly valuable as references for the shape designer and modeler. Many of the decorations are typically terra-cotta treatments, and as such, the book should be received with great interest by the architectural ware people.

F. H. RHEAD

Laboratory Manual of Colloid Chemistry. HARRY N. HOLMES, Professor of Chemistry in Oberlin College. John Wiley and Sons, Inc., New York; Chapman and Hall, Limited, London, 1922. xii+127 pp., 32 figs. 23.5 x 15 cm.

It was at the suggestion of the Colloid Committee of the National Research Council that this most excellent manual was written by Dr. Holmes and this committee deserves much credit in the selection of the author. The subject matter is taken up under the following sixteen chapter headings: Suspension; Dialysis and Diffusion; Condensation Methods of Preparation; Dispersion Methods of Preparation; Coagulation; Protective Colloids; Solvated Colloids; Surface Tension; Emulsions; Viscosity; Adsorption from Solution; Adsorption of Gases; Reaction in Gels; Experiments with the Ultramicroscope; Soils and Clays; Special Topics. There are in all 186 experiments carefully selected to illustrate the principles involved and accompanied by short discussions of the theory, in which many references are made to the current literature, The manual also contains a short but excellent bibliography. It is so written that it is admirably suited for use in supervised laboratory courses in colloid chemistry and at the same time equally serviceable for those who desire independently to become more familiar with this subject. Lists of experiments for the following special courses are given: A General Course; A Course for Medical Students; A Course for Students of Ceramics and Agriculture; A Course for Students of Geology; and A Course for Students of Industrial Chemistry. The book is well written and has already proved to be a valuable addition to the Colloid Chemical literature. W. G. FRANCE

Henley's Twentieth Century Formulas, Recipes and Processes. Edited by Gardner D. Hiscox, M.E., The Norman W. Henley Publishing Co., New York City. 1922. $4.00.

Containing over seven hundred pages of formulas, recipes and processes for the workshop and practical man. Acid-proofing, Adhesives, Alloys, Aluminum and its treatment, Amalgams, Bronzing, Brass Casting, Celluloid, Cements, Dyes, Enameling Explosives, Glass, Inks, Jewelers' Formulas, Lacquers, Lubricants, Photography, Plating, Rust Preventives, Soaps, Solders, Artificial Stone, Varnishes, Waterproofing, Wax, are only a few subjects selected at random. The technical man will smile during his perusal of the ten pages of old-fashioned (but reliable) formulas under the heading of ceramics, but this will not prevent the book from being what is claimed for it; "a useful reference work for the mechanic, manufacturer, artisan and the general home worker."

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Vol. 2 | March, 1923 | No. 3

Author Index[1] to Abstracts for March

Author	Number of abstract
Anon	2, 10, 39, 79, 90, 91, 148
Ayres, E. B	29
Bagge, P. F	146
Baillie, W. L	111
Ballo, R. and Jugovics, L	45
Barringer, L. E	22
Bied, J	144
Bingham, E. C., Bruce, H. D. and Wolbach, M. O., Jr	42
Bird, C. A	58
Bitting, A. W	100
Block, Berthold	25
Böiboul, M	62
British-Houston Co., Ltd	51
Brown, W. D. R. and Pickston, W. T	35
Catlett, C	158
Collins, E. F	17, 52
Cordenot, L. A	85
Corse, W. M	14
Craven, M. B	80
Crossley, P. B	118
d'Adrian, A. L. Duval	61, 126
Davis, H. E	133
de Mejer, E. C	94
Denk, F. J	101
Dimbleby, V., Muirhead, C. M. M. and Turner, W. E. S	109
Duckham, A. M	6, 70
Eichenberger, F	72
Elsenbast, A. S. and Jordan, W. L	73
Feldenheimer, W. and Plowman, W. W	48
Flemming, A. P. M	59
Fleming, A. G	147
Flinn, A. D	15
Frank, E	130
Frink, R. L	122
Fuha, Kitsuzo	96, 121
Fujiyama, Tsuneichi	149
Fukuoka, Daigoro	88
Fukuzawa, Seikichi, Fukuzawa, Ito, and Toyo Gyps Co	156
Good, R	132
Granger, Albert	5
Grigorovitch, K. P	55
Grün, Richard	142
Hagiwara, Kiyohiko, Morimoto, Kan-ichi, Ueda, Kiyoshi, and Hiraoka, Taitaro	95
Hallimond, A. F	41
Hatanaka, Toyoji	152
Helbig, A. B	7
Hess, H. W	113, 114, 115
Hirano, Kosuke	60
Hull, W. A	56
Igranic Electric Co., Ltd	33, 34
Ikeda, Kikunae, Isobe, Hajime and Okazawa, Tsuruji	47
Ishikawa, Giichi	36
Jeanneret, F. B	139
Jones, L. T	27, 28
Kallauner, O and Hruda, I	92
Kato, Komakichi and Kamibayashi, Chiaki	151
Kingsbury, Percy C	76
Kishi, Ichita	154
Kishimoto, Tatsujiro	20
Kohama, Hiroshi	37
Kondo, Seiji and Nakao, Masaru	89
Koreavaar, A	19
Krak, J. B	110
Kühl, H	116
Linebarger, C. E	30
Locke, F. M	125
Lösenbeck, Otto	46
Louis, Denis	68
Lowry, T. M. and McHatton, L. C	23
MacMichael, H. A	78
MacMichael, R. F	4
Mano, Nakajiro and Yanaka, Ryujiro	153
Marckworth, O. S	131
Mathews, J. A	53
Mattison, R. V	157
McDonald, J. U	124
Menzies, A. W. C. and Beebe, R	44
Metallbank und Metallurgische Ges. Akt. Ges	21
Meurer, N	135
Miki, Sachio	155
Miner, Harlan S	12
Minton, R. H	8
Montgomery, G. L	81
Morey, G. W	102
Morey, G. W. and Bowen, N. L	108
Myers, W. F	137
Nagasawa, Takeo	136
Nagasaki, Shinsaku	83
Nakamura, Kihichi	150
Nakamura, S	107
Newcomb, E. W	26

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Author Index to Abstracts for March (*Continued*)

Author	Number of abstracts
Nichols, Wm. H.	13
Niimura, Shintaro	82
Orton, Edward, Jr	9
Ostwald, Wilhelm	16
Parkert, O.	117
Peacock, S.	123
Pease, G. S.	63
Platzmann	145
Plauson	49
Prevost, Pierre	138
Radley, E. G.	41
Rawlins, C. D.	1
Rebuffat, O.	71
Rees, W. J.	54
Rennerfelt, I.	64
Richmond, H. A. and MacDonald R.	74
Riddle, F. H.	86
Rideal, E. K., and Thomas, Wm.	40
Ries, H. and Bayley, W. S.	38
Rigby, T.	50
Roesch, A.	31, 32
Rohn, W.	65
Rossman, W. F.	69
Scott, W. S.	134
Shakespear, G. A.	24
Sherwin, R. S.	75
Shimazu, Genzo	120
Shinagawa, Yuichi, and Yoshizaka, Seizaburo	84
Silica Syndicate, Ltd.	119
Smith, C. D.	112
Steger, W.	57
Sullivan, E. C. and Taylor, W. C.	128
Taylor, T. S.	11
Taylor, W. C.	129
Travers, M. W.	98, 99
Treischel, C. C.	87
Trinks, W.	18
Turner, W. E. S.	97, 104
Turner, W. E. S. and Wilson, T. E.	105
Twyman, F.	103
Van Marle, M.	127
Weigel, W. M.	77
Whatmough, W. A.	106
White, C. A.	66, 67
Whitby, B. R.	159
Williams, W. D.	43
Witt, J. C.	140, 141, 143
Yashoro, Tamotsu	3
Yokoi, Ichiro	93

General and Miscellaneous

1. Chemical industry in Greece. C. D. RAWLINS. *Chem. Trade Jour.* (London), **71**, 231(1922).—The chem. indus. in Greece is making progress. There are 4 factories for the manuf. of glass and pottery with up-to-date plants. Fertilizers are made in one large factory. Sulphuric acid is also manufd. out of local pyrites. There is one factory for the manuf. of aniline dyes; soap and sulphur oil are old-established industries and turpentine oil and colophon are distilled from local pine resin. O. P. R. O.

2. Bentonite used in the de-inking of paper. ANON. *The Chem. Age*, **7**, 668 (1922).—Bentonite, the natural mineral substance, has been found to be an extremely efficient agent for de-inking old newspapers and has been described as a natural soap on account of its detergent properties. In the exptl. tests with the material on old newspapers, bentonite was used with just sufficient alkali to loosen the ink without discoloring the paper. It was found that the small particles of the mineral could be easily carried through the ordinary washing screen. O. P. R. O.

3. Report of experiments with a gas-producer. TAMOTSU YASHORO. *J. Jap. Cer. Assoc.*, **361**, 424–42(1922).—The author performed 83 expts. with a Dowson gas-producer at the Tsurumi plant of the company. The producer had a water-sealed Thwaite's ash-pit with a steam-blower. It consumed 18,700 lbs. of a Hokkaido coal, consisting of 77.8% lumps, 21.9% medium lumps and 1.2% small coal, per day. It was poked 5 times an hr.—(1) *Temp. in the producer.*—The most suitable temp. of coke-layer was 1000–1100°C. When it was cooled below 800°C, the gas was useless. (2) *Propn. of steam and air.*—The best gas was produced when they were introduced to the blower in the propn. of 75.18% air and 24.82% steam in vol. (3) *Thickness of fire-bed.*—The best results were obtained when the layers of coke and coal were 18″ to 20″ and 17″ to 20″ thick respectively. Besides, descriptions on the removal of ashes, velocity of air and steam passing through fire-bed and the pressure of steam are given. S. KONDO

4. Tests to determine the uses for clay. R. F. MACMICHAEL. *Brit. Clayworker*, **29**, 189(1920–21); *J. Soc. Glass Tech.*, **5**, 28–9.—The general phys. characteristics were

first noted. These included color, hardness, fracture, uniformity, org. matter, foreign material, behavior in crushing, pugging and forcing through dies. Plasticity was detd. by noting the amt. of water required to form a slip of standard viscosity. The clay was blunged, deflocculated to its max. viscosity with a suitable electrolyte, and dild. with H_2O to a standard viscosity. The amt. of water contained in the slip was detd. and was a measure of the plasticity. The wet-strength of the clay was tested in a machine similar in operation to the ordinary cement-testing machine. Blunging and screening through a 200-mesh sieve sepd. the clay into two portions, each of which was dried and weighed and its character noted. Chem. analysis was made as usual. Drying qualities were examd. by drying 100 g. of wet clay in briquet form at 160°F under standard conditions. A balance and shrinkage gage indicated the loss of wt. and shrinkage simultaneously. For tests on dry and fired material, bars half an in. in diam. were expressed on to a grooved board and cut into 5-in. lengths. The bars were then stamped with a sample number and notched with a 100 mm. gage and the av. wet wt. was noted. On these samples drying shrinkage, firing shrinkage, breaking wt. (transverse), warping, loss of wt., porosity, and d. were detd. The point at which a sample sagged under its own wt. on heating was taken as its refractory index. H. G. (*C. A.*)

5. The firing of ceramic products in electrically heated furnaces. Albert Granger. *Compt. rend.*, **175**, 98–100(1922).—Furnaces heated electrically by Pt wire or by granulated C, were used in lab. tests. China fired white, a ferruginous stoneware red and Sevres porcelain an amber tint, all about like products from the ordinary kiln. Hard porcelain fired gray, and had the appearance of com. porcelain fired in a too highly reducing atm. This gray color is usually explained by the occlusion of C deposited from the flame. In this case the corundum furnace, where no flame existed, was sufficiently porous for CO to penetrate, whereupon it deposits C according to the probable reaction: $2CO \longrightarrow C + CO_2$. This blackening was avoided when CO was eliminated by a moderate draft. C. C. D. (*C. A.*)

6. Some new forms of kilns. A. Duckham. *Engineering*, **114**, 534–6(1922).—Two kilns, one continuous, the other tunnel, are described. The continuous kiln has 16 chambers each 19 ft. wide, 17 ft. long, 6 ft. high at the sides and 10 ft. at the middle. The chambers are in 2 rows of 8 each. There are 4 fireboxes, 2 on each side of each chamber. Fire bricks are burned to cone 13. Fuel consumption is 20–25 tons of coal per 100 tons of brick. Air leakage, chiefly through the main dampers to the chambers, interfered with draft and cast iron flap doors were put in. Artificial draft also was introduced. A new modification with central bags feeding producer gas is described. The tunnel kiln described has a fixed central heating zone and the hot gases follow a zig-zag path. A modification in annular form was devized for burning glazed ware. Excellent drawings are given. C. H. K. (*C. A.*)

7. The dangers of powdered fuel. A. B. Helbig. *Feuerungstechnik*, **10**, 188–90 (1922).—Coal dust will not burn unless very intimately mixed with air in proper proportions. Mills for powd. coal are not dangerous, even if fed with glowing coal, or pieces of steel that produce copious sparks. Kept in large closed silos powd. coal is not dangerous, so long as these have no dead spaces where the coal is not disturbed. Great cleanliness in the plant, avoidance of dust clouds, and care in igniting coal dust flames will make this as safe as any industrial process. E. W. T. (*C. A.*)

8. Historical sketch of the pottery industry. R. H. Minton. *The New Jersey Ceramist*, **2** [3], 179(1922).—The paper covers briefly the historical development of porcelain, both oriental and occidental. C. W. Parmelee

9. Address at the dedication of the New Ceramics Building at Rutgers College. Ed. Orton, Jr. *New Jersey Ceramist*, June, 96(1922).—A brief statement of the inception of ceram. ed. in the United States. C. W. Parmelee

10. Samuel Wesley Stratton. ANON. *Elec. World,* **80,** 860(1922); 1 illus.—Biographical sketch. See also *Bull. Amer. Ceram. Soc.,* **1** [11], 331–32(1922).
C. G. F. (*C. A.*)

11. Stimulating research by organization. T. S. TAYLOR. *Elec. World,* **80,** 961–2(1922).—A clear and concise expression of an ideal research lab. organization.
C. G. F. (*C. A.*)

12. Grasselli Medal award (to Walter H. Fulweiler). Presentation. HARLAN S. MINER. *J. Ind. Eng. Chem.,* **14,** 1154–5(1922). **Acceptance.** *Ibid.,* 1155.
E. J. C. (*C. A.*)

13. Ernest Solvay—an appreciation. WM. H. NICHOLS. *J. Ind. Eng. Chem.,* **14,** 1156–8(1922).—An obituary. E. J. C. (*C. A.*)

14. Federal and state research agencies. W. M. CORSE. *Trans. Am. Soc. Steel Treating,* **3,** 231–8(1922).—An address. W. A. M. (*C. A.*)

15. Research for engineering societies. A. D. FLINN. *Trans. Am. Soc. Steel Treating,* **3,** 218–25(1922).—An address. W. A. M. (*C. A.*)

16. What progress has the new science of color brought? WILHELM OSTWALD. *Z. Elektrochem.,* **28,** 398–404(1922).—An address. H. J. C. (*C. A.*)

17. Electric heat, its generation, propagation and application to industrial processes. E. F. COLLINS. *Trans. Am. Electrochem. Soc.,* **42,** preprint(1922).—The development of elec. heat by passage of current through solid resistors, through liquid and through gaseous media is discussed at length, reference being made in particular to the fundamental theoretical principles. An efficient, com. elec. heating app. must be constructed with due regard to chem. reactions taking place, to the effect of mech. changes, such as expansion with heat, to phys. factors such as heat transmission and heat emissivity and to the comparative cost and operating factors. C. G. F. (*C. A.*)

18. Heat balances of blast furnace and steel plants. W. TRINKS. *Blast Furnace Steel Plant,* **10,** 451–6(1922).—Ideal heat balance charts are given for (1) an uneconomical steel plant, (2) an av. American plant, (3) an economical steam-operated plant, and (4) an ideally operated plant. Per lb. of finished steel produced plant (1) uses 2.25 lbs. of coal; plant (2), 1.5 lbs.; plant (3), 1.065 lbs.; plant (4) 0.89 lbs.
L. J. (*C. A.*)

19. The theory of gas producers and its application to blast furnace operations. A. KOREAVAAR. *Chimie et industrie,* **8,** 12–25(1922).—K. puts forward a theory of gas producers based partly on that of H. LeChatelier ("Le Chauffage Industriel"), partly on that of J. E. Johnson (Principles, Operation and Products of the Blast Furnace), and partly on Langmuir's theory of the reaction of a heterogeneous system (*C. A.,* **10,** 3007). He investigates the influence of the activity, size and porosity of the C and of the quantity and temp. of the air on the vol. and temp. of the zone of combustion. He applies his findings to that portion of the blast furnace which is in the immediate neighborhood of the tuyeres, and concludes that (1) the more oxidizable the coke the lower the consumption for a given temp.; (2) for a given temp. hot air requires a lower coke consumption than cold air; (3) "low coke consumption goes hand in hand with low wind," proper temp. being obtained by suitable quality of the coke and preheating of the air; (4) heating the air above a certain "critical temp." (about 800°) does not appreciably increase the temp. of the zone of combustion, and hence does not appreciably cut down coke consumption; (5) by increasing the amt. of air above a certain "critical value," the temp. is not increased, but the vol. of the zone of combustion can be increased as much as desired, within the limits of possibility. A. P.-C. (*C. A.*)

PATENTS

20. Roofing-tile kiln. TATSUJIRO KISHIMOTO. Japan 43,050, July 11, 1922. A roofing-tile kiln has three chambers which are arranged so as to form an arch. In

other words, the middle chamber is built over the passage between the other two. The waste-gases of the lower chambers are made to pass through the middle one.

S. KONDO

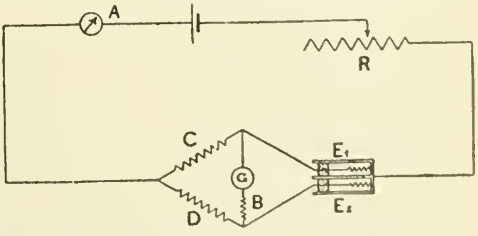
21. Electric dust precipitation. METALLBANK UND METALLURGISCHE GES. AKT.-GES. Brit. 177,117, Sept. 23, 1921. Furnace gases are cooled to the dew point or below, whereby they are de-ionized, and are heated again in such a way as to prevent ionization by flames, etc. The gases then enter an elec. precipitator, in which dry deposits are thus obtained. (*C. A.*)

22. Electrical insulating composition. L. E. BARRINGER. U. S. 1,423,985, July 25. An insulating compn. which is resistant to heat is formed of shellac, NH_4OH and Na silicate with coloring and filling materials. (*C. A.*)

Apparatus and Instruments

23. The grading of powders by elutriation. T. M. LOWRY AND L. C. MCHATTON. *J. Oil Colour Chem. Assoc.*, **5**, 82–91(1922).—Grading of powders such as Portland cements and paint pigments by sieving air and H_2O-flotation, etc. is reviewed. The most satisfactory elutriator is the single vessel form described by Boswell (Brit. Resources of Sands and Rocks Used in Glassmaking, 2nd ed. (1918)). With this app., barytes and quartz powders were fractionated by a vertical flow of H_2O at 4, 5, 6, 7, and 8 mm. per sec., and the particle diams. detd. microscopically. The grading is much more exact in a tube of 27 mm. diam. than in one of 13 mm. diam. because of the friction on the walls and the resultant gradient in the velocity of flow. The crit. diam. of the particles is about 5% greater in the narrow than in the wide tube. The crit. particle diam. decreases with rising temp. of the H_2O. The relation between diam. of grains and velocity of flow is not a linear function, nor does it obey the square or square root law as commonly stated. Under identical conditions, the diams. are 1.42 times as great for quartz as for barytes, so that sectional areas are as 2.0 : 1. This ratio is identical with the gravitational forces on the immersed particles. The lifting power of the H_2O is therefore proportional to the area of the particle. Results are tabulated and plotted. Illus. with photomicrographs. Discussion. F. A. W. (*C. A.*)

24. Electrical carbon dioxide recorders. G. A. SHAKESPEAR. *Electrician*, **89**, 543 (1922).—Most of the instruments now available for measuring CO_2 in flue gases depend on one or several chem. reactions; the chemicals have to be replenished from time to time and besides there is the disadvantage of delicate glassware in the construction. The new recorder described is a decided improvement over these older types. The underlying principle of the new type: Two identical spirals of Pt wire are enclosed in two sep. cells, E_1 and E_2 (see fig.) in a metal block. Each of the spirals is connected to one arm of a Wheatstone bridge, the other 2 arms, *C* and *D*, being of manganin. Current flowing through the bridge heats the Pt spirals and causes them to lose heat to the walls of the cells. If the compn. of the gas of one cell is different from that of the other, the thermal cond. and hence the cooling rate will be different, giving rise to difference in temp. of the 2 wires. The difference in temp. will cause a deflection of the galvanometer, the greater the temp. difference the greater the deflection. One cell is filled with air and sealed and the other is exposed to the flue gas. A filter of glass wool and Fe borings is placed ahead of the open cell to protect the Pt. Further details are given. C. G. F. (*C. A.*)



25. The sieve centrifugal. Berthold Block. *Chem. App.*, 9, 88–91, 117–20, 141–4, 153–6, 169–71, 177–9, 189–92(1922).—A discussion, with 58 cuts, of the construction of centrifugals with mech. discharge, semi-automatic centrifugals, continuously operating centrifugals, of the proper weave of the top sieve for materials of different grain, of the proper construction of the sieve backing to prevent clogging, of the proper clothing, with references to the literature and Ger. patents. J. H. M. (*C. A.*)

26. A new type of automatic temperature regulator and its application to heat-treating furnaces. R. W. Newcomb. *Trans. Am. Soc. Steel Treating*, 3, 28–102 (1922).—The regulator consists of 4 parts: the frame and bed plate, a $^1/_{12}$ h. p. motor with worm and worm gear speed reductions, an escapement or ratchet mechanism and a contractor. One sprocket, mounted on a ratchet wheel spindle, is connected by a sprocket chain to another sprocket wheel attached to the valve or other appliance to be regulated. When either one of the solenoids is energized one of the pawls of the escapement mechanism engages with the ratchet wheel and moves it in one direction or the other depending upon which pawl is engaged. The movement of the ratchet wheel depends upon the setting of the wrist pin at the cam. Proper selection of the sprockets can be made to correspond to open and closed valve positions. W. A. M. (*C. A.*)

27. New rotary mercury pump. L. T. Jones. *Phys. Rev.*, 18, 332(1921).—This pump is a liquid piston pump with Hg level remaining const. The rotation of an iron drum forces air from the high vacuum side along the axis of the drum to the low vacuum side where it is removed by an auxiliary pump capable of producing a vacuum of about 1 mm. The general performance is of the same order as that of the Gaede pump. D. MacR. (*C. A.*)

28. Simplest mercury vapor pump. L. T. Jones. *Phys. Rev.*, 18, 332(1921).—A bulb contg. about 25 cc. of Hg is heated by a Bunsen burner and the vapor rises through a nozzle into a water jacketed chamber. The air intake is situated a little below the end of the nozzle but above the lower end of the water jacket. A fore pump capable of producing a vacuum of about 0.001 mm. removes the air from the top. Pyrex glass is used. D. MacR. (*C. A.*)

PATENTS

29. Apparatus for drying thin plates or other clay articles. E. B. Ayres. U. S. 1,429,997, Sept. 26. (*C. A.*)

30. Hydrometer. C. E. Linebarger. U. S. 1,424,730, Aug. 1. Homogeneous substances of different densities are enclosed in the hydrometer tube to indicate different sp. grs. even if these substances become broken within the tube. (*C. A.*)

31. Apparatus for controlling heating of vulcanizers or other apparatus. A. Roesch. U. S. 1,430,852, Oct. 3. (*C. A.*)

32. Apparatus for controlling humidity of air. A. Roesch. U. S. 1,430,853, Oct. 3. (*C. A.*)

33. Calorimeters. Igranic Electric Co., Ltd. Brit. 183,408, April 7, 1921. In a continuous-flow gas calorimeter, the burner and associated parts are so constructed that the stream of fluid which absorbs the heat of combustion is made to flow after such heat absorption in heat-exchanging relation with the same stream before or during the absorption of heat. Further, the products of combustion are made to flow in heat-exchanging relation with the combustible mixt. so as to preheat the latter. (*C. A.*)

34. Calorimeters. Igranic Electric Co., Ltd. Brit. 183,409, April 7, 1921. In a continuous-flow gas calorimeter in which resistance thermometers are subjected to the initial and final temps. of a fluid which absorbs the heat of combustion, the thermometers are so constructed that their temp. resistance coeffs. vary in such a way that a const. relation between their resistances is maintained for a given calorific value of the gas, irrespective of the actual temp. level at which the test is carried out. The invention is

described in connection with a calorimeter of the kind described in 153,817 (*C. A.* **15**, 964), each of the thermometers contg., *e. g.*, Ni and Cu in such proportions that the desired result is obtained despite variations in the sp. heat of the heat-absorbing air and in the vapor content of the test gas, caused by variations in the temp. of the water tank contg. the wet meters supplying the gas, etc. (*C. A.*)

35. Gas-analyzing apparatus. W. D. R. Brown and W. T. Pickston. U. S. 1,422,080, July 11. The app. is adapted for automatic and continuous analysis of flue and other gases. It comprizes initial and residual gas-measuring chambers with connections such that withdrawal of the sealing liquid from the initial gas-measuring chamber by a vacuum serves to unseal the exit of the residual gas-measuring chamber. (*C. A.*)

36. Continuous centrifugal separator. Giichi Ishikawa. Japan 39,669, Aug. 23, 1921. A conical cage is used as a revolving separator, the narrow part being the top. Solid sepd. from the liquid is continuously collected in the bottom. (*C. A.*)

37. Centrifugal water separator. Hiroshi Kohama. Japan 39,671, Aug. 23, 1921. The gearing of the revolving axis and gear wheel is easily detached, so the latter is quickly stopped. (*C. A.*)

Chemistry, Physics and Geology

38. High grade clays of the eastern United States. (With notes on some Western Clays.) H. Ries and W. S. Bayley. U. S. Geological Survey, *Bull.* **708** (1922).—A survey of the worked deposits of the high grade clays, such as kaolins, ball clays, and some of the refractory bond clays. The requirements of clays for porcelain, glass house refractories, abrasives, paints, paper, linoleum, etc. are discussed. The rept. gives detailed information on the occurrence and properties of the clays found in the several sections of the U. S., and describes the methods of mining, prepn. of the clays, and information as to the size and nature of deposit, at the individual mines now producing high grade clays for the ceram. indus. This rept. of 300 pages should be of particular interest to those using Amer. clays or contemplating the substitution of these clays for those imported from Europe. R. R. Danielson

39. Copiapite. Anon. *Min. Jour.*; **135**, 852(1921).—A large deposit of copiapite (a hydrated basic sulphate of iron, rarely met with) has been located in the northeast of S. Australia. It appears to have resulted from the oxidation of marcasite, and occurs as a lode in blue slate. On ignition, the yellow copiapite yields a rich Venetian red, and a company has been formed to open up the deposit as a source of pigments and sulphur. O. P. R. O.

40. Adsorption and catalysis in fuller's earth. E. K. Rideal and Wm. Thomas. *J. Chem. Soc.*, **121**, 2119–24(1922).—Fuller's earths from Surrey, Somerset and Florida are not equally efficient in the *bleaching of edible oils*. The relations between the adsorptive and catalytic properties of these earths were examd. to obtain an explanation. The sp. surfaces were detd. to be in the ratios of 2.35, 2.13 and 1, resp. The adsorptive powers for methylene blue were in the ratios of 2.54, 2.18 and 1. The catalytic actions on H_2O_2, as measured by the reaction velocity coeffs., were 2.31, 0.58 and 2.51. Color bleaching may consist of both adsorptive and catalytic processes. The iron content of the 3 earths was possibly the governing factor in the catalysis. H. C. P. (*C. A.*)

41. Glauconite from the green sand near Lewes, Sussex; the constitution of glauconite. A. F. Hallimond. **Chemical analysis.** E. G. Radley. *Mineralog. Mag.*, **19**, 330–3(1922).—The grains, sepd. by sieving, had mean n = 1.62 and sp. gr. = 2.70. Analysis gave: SiO_2 48.12; Al_2O_3 9.16; Fe_2O_3 19.10; FeO 3.47; CaO 0.76; MgO 2.36; K_2O 7.08; Na_2O 0.22; H_2O (105°) 4.78; H_2O>105° 5.28%. In order to det. the constitution of the mineral many analyses were recalcd. in mol. proportions.

The proportion of alkalies was found to be quite const. and no evidence of the substitution of these by H_2O or by the magnesia group was detected. There is considerable replacement of the K_2O by Na_2O. In the groups R_2O_3 and RO the mol. proportions are not constant and indicate no relationship to the silica and alkalies. If the (Fe, Mg)O and (Fe, Al)$_2O_3$ are considered as mutually replaceable, the ratios obtained lead to the formula, $R_2O.4(R_2O_3, RO).10SiO_2.nH_2O$, the ratio of bases to silica being 1:2.
W. F. H. (*C. A.*)

42. The plastometer as an instrument for process control. E. C. Bingham, H. D. Bruce and M. O. Wolbach, Jr. *J. Ind. Eng. Chem.*, **14**, 1014-5(1922).—Amorphous materials often lack definite characteristics, melting point, soly., and fluidity. The authors suggest the use of (1) the yield value, (2) the mobility, (3) the concn. of zero mobility—connected with the pore space, (4) the concn. of zero yield value—connected with particle size, and (5) the temp. at which the yield value becomes zero—analogous to the melting point. The authors also distinguish between plastic and pseudo-plastic materials. E. C. B. (*C. A.*)

43. Light metal alloys for pistons. W. D. Williams. *Raw Material*, **5**, 259–66 (1922).—The disadvantages and advantages of *Al alloys* over steel and cast Fe are discussed. The difficulties encountered in the manuf. of Al alloys and their subsequent treatment for use as pistons, together with a discussion as to how to overcome these difficulties, are considered. Al alloys are also used in the manuf. of cylinders for power cars. The prospects for the new Mg alloys, which in many cases are preferred to the Al alloys, depends mainly on the soln. of the question of cost and of production in sufficient quantities. V. O. H. (*C. A.*)

44. The forms of gas and liquid cavities in gels, and their interpretation by surface compression. A. W. C. Menzies and R. Beebe. *Science*, **55**, 75–6(1922).—With gelatin and silica gels in air-satd. media, controllable *bubbles* are produced by rise of temp. and reduction of air pressure. The phenomena permit of an interpretation from the point of view of *surface compression* rather than of surface tension. In a gel, space occupied by a bubble which has been caused to diminish becomes filled with liquid. This phenomenon has not before been described. These cavities are of two forms. (1) Derived from gas cavities of oblate spheroidal form they take the shape of bivalve molluscs, the "shells" being shaped like segments of spheres, bowls, etc. While the sphere is the stable form enveloped by a membrane under surface tension, this is not the case if the membrane is under surface compression. The membrane is thus thrust out at surfaces of smallest radius of curvature, giving rise to the forms observed. (2) Derived from cavities of prolate spheroidal form they take the form of a solid of three lunes, having one axis of triad symmetry perpendicular to one plane of symmetry. The three segments of the surface are of "orange peel" shape. "It is believed that the forms here described and interpreted are unique in organic nature." H. W. B. (*C. A.*)

45. The theory of the formation of dolomite. R. Ballo and L. Jugovics. *Földtani Közlöny*, **45**, 221–33 (Hungarian), 286–92 (French) (1915); *Mineralog. Abstracts*, **1**, 317.—Expts. were made on the action of H_2S, NH_4, and SiO_2 (as an alk. silicate soln.) on the system $CaCl_2 + MgCl_2 + Na_2CO_3 + NaCl + H_2O$ at 18–20° and normal pressure. These show that under those conditions dolomite is not formed. Crystals of artificial *nesquehonite* are described with $n = 1.4745 - 1.557$. E. F. H. (*C. A.*)

46. An investigation of the electrical properties of silica acid sols. Otto Lösenbeck. *Kolloidchem. Beihefte*, **16**, 27–46(1922).—The addn. of silicic acid sol decreased the cond. of solns. of HCl, at first rapidly and then always less, according to an *e*-function. The curve finally approached asymptotically the limiting value. The migration velocity of SiO_2 particles was detd. experimentally and substituted in Smoluchowski's equation in order to calc. the contact potential. This equation (cf. *Krak. Anz*, **1903**, 182) is $U =$

$Vk/4\pi\eta$, in which U is the migration velocity for a field strength of 1 E. S. unit, V is the p. d. of the double layer in E. S. units, k is the dielec. const. for H_2O and η is the viscosity of H_2O in C. G. S. units. As shown by cataphoresis, the SiO_2 particles were negatively charged. This negative charge decreased with each addn. of HCl to zero at the isoelec. point and finally the particles assumed a positive charge greater than the negative charge for the acid-free sol. The behavior of the SiO_2 particles was not uniform. Measurements for different concns. of the same sol showed the contact potential to be dependent on the concn. To explain the observed facts the suggestion is made that the SiO_2 particles absorb the HCl like a sponge. H. M. McL. (*C. A.*)

PATENTS

47. Process of giving form to fuller's earth. Kikunae Ikeda, Hajime Isobe and Tsuruji Okazawa. Japan 42,368, April 20 (1922). Short rough-surfaced cords or threads are made by pressing a mass which has been prepared by kneading a mixture of fuller's earth or Florida earth and 80–110% of water through a small opening. They are then heated at 150–600°C. These cords or threads are used for drying air.

S. Kondo

48. Treating clay. W. Feldenheimer and W. W. Plowman. Brit. 184,271, May 9, 1921. A process for the treatment of clay comprizes deflocculation of the clay in an aq. medium by means of a dil. soln. of HPO_3 or the metaphosphate of an alkali either alone or in conjunction with an alkali such as Na_2CO_3. The proportion of deflocculator may be varied according to the hardness of the H_2O used. The clay may be subsequently recovered from its suspension in any desired manner. When flocculation is adopted an aq. soln. of alum, or $NaHCO_3$ may be used as a flocculator, in the manner described in 121,191. Cf. *Ceram. Abs.*, 1 [10], 251. (*C. A.*)

49. Refining clay. Plauson's (Parent Co.), Ltd. Brit. 184,880, May 21, 1921. Pure kaolin is prepd. by sepn. of SiO_2 and other silicates by intensive mechanical disintegration at a peripheral speed of over 1000 m. per min., preferably in the colloid mill described in 155,836, with H_2O and with or without a dispersator, the kaolin being selectively colloidalized. Suitable dispersators are water-glass, tanning agents, humus and humic acids or their compds., saponin and other soap-like froth-forming substances or sol. silicates, aluminates, ferrocyanides, thiocyanates and borates. The resulting dispersion may be concd. by ultra-filter presses. The colloidal clay may be used in the manuf. of colloidal inks, as a filler in rubber mixings, etc. Cf. 3592, **1880.** (*C. A.*)

50. Drying clay. T. Rigby. Brit. 183,535, April 16, 1921. Pastes of china or like clay such as are dug from the ordinary settling pits are dried by being spread as films upon heated surfaces in app. such as that described in 149,055, in which the surfaces are heated by the vapors evolved from the film, after compression, or in the multiple-effect app. described in 180,963, and 181,035. A suitable construction is specified. (*C. A.*)

51. Porcelain. British-Houston Co., Ltd. Brit. 184,090, Sept. 27, 1921. A ceramic material particularly suitable for elec. insulation is obtained by firing a mixt. contg. 5–35% of beryl in addition to the usual ingredients, such as clay, silica, and feldspar. (*C. A.*)

Refractories and Furnaces

52. Materials for furnaces and ovens. E. F. Collins. *Chem. and Met. Eng.*, **28**, 79(1923).—An abstract of a paper by E. F. Collins, on "Electric Heat, Its Generation and Application to Industrial Processes," presented before the Amer. Electrochem. Soc. Charts and tables are reproduced showing the limitations of various metals and ceramic products for furnaces, particularly elec. heated equipment. One chart shows the thermal resistance of heat insulators, refractories, and heat conductors.

R. R. Danielson

53. Electric furnaces produce quality steel. J. A. Matthews. *Elec. World,* **80,** 1086, 1088, 1091(1922); 6 illus.—The reasons for the world-wide expansion of elec. steel making are (1) cheapening of wholesale power rates, (2) extreme flexibility and adaptability of furnace, and (3) superior quality of product. For installed elec. furnace capacity, Italy now ranks ahead of Germany, England and France, and second only to the U. S. C. G. F. (*C. A.*)

54. Refractories for electric furnaces. W. J. Rees. *Foundry Trade J.,* **23,** 66–7 (1921); *J. Inst. Metals,* **27,** 525.—The desirable properties of a dependable refractory for an elec. furnace lining are: (1) high m. p. and strength at high temp.; (2) uniformity of vol.; (3) high resistance to abrupt temp. changes; (4) high resistance to slag and metal attack; (5) high resistance to abrasion of hot gases; (6) low elec. cond.; (7) low sp. heat. H. G. (*C. A.*)

55. Electric furnaces for the melting of steel. K. P. Grigorovitch. *Rev. metal.,* **19,** Abs. Sec., 412–13(1922).—A review of the resistance (Hoskins), the induction (Rodenhauser), and the arc (Rennerfeld and Heroult) types of elec. furnaces and their industrial applications. W. A. Mudge (*C. A.*).

56. A study of refractories. W. A. Hull. *The Ceramist,* **2** [3], 205(1922).—General discussion of the properties, uses and a résumé of the work which has been done by the Bureau of Standards on refractory clays and refractories. The author concludes that no important advance has been made in the writing of specifications for refractories since 1911. C. W. Parmelee

57. Determination of the softening temperature of refractory materials under load. W. Steger. *Ber. deuts. keram. Ges.,* **3,** 1–4(1922)—The test-piece, in the form of a small cylinder, is supported on a refractory cylinder of electrode C, 6 cm. diam., and heated in a vertical cylindrical elec. resistance furnace 8 cm. diam., internally, with an e. m. f. of 100–120 v. A second (hollow) C cylinder stands on the test-piece and is provided at its upper end with a plate to which the pressure from a scale-pan carrying weights of 20–100 kg. is transmitted through a simple system of levers. The small movement of the last lever in the series is marked on a rotating drum by means of a light index, about 1 m. in length, which magnifies it 20 times. The hollow C cylinder enables the top of the test-piece to be inspected and its temp. to be measured by an optical pyrometer or a thermoelectric couple. J. S. C. I.

58. Electric furnace melting. C. A. Bird. *Chem. Met. Eng.,* **26,** 870–1(1922).—Advance in elec. furnace applications might be hastened by attention to progress in refractories, elimination of inherently poor designs, and by seeing that competent operators are in charge of all furnaces supplied. L. J.

59. Some developments in insulating materials and processes in Great Britain. A. P. M. Fleming. *India Rubber J.,* **64,** 641–4(1922).—Life tests of insulating materials under lab. conditions have heretofore given results not conforming well with results under practical service conditions over extensive periods. New procedures are suggested in 2 directions: (1) the use of higher temp. limits whenever safe and (2) a comparison of machine performance on a basis of temp. rise in place of a basis of total temp. as recommended by the International Electrotech. Commission. Particulars are given of the facilities established for research, with a discussion of important developments in insulating materials and processes used in various types of elec. app., with special reference to thermal considerations. C. C. D. (*C. A.*)

60. Report on the Manchurian magnesite. Kosuke Hirano. *J. Jap. Cer. Assoc.,* **361,** 414–23(1922).—Color, appearance, sp. gr., chem. compn. and burning behaviors of 102 specimens of magnesites which were collected from all mine-lots possessed by the South-Manchurian R. R. Co. except the Mt. Kamba and the Mt. Gyushin whose magnesites were reported by the author in the April of 1919, are described in

details. The range of sp. gr. is 2.76–3.01. They have following compns.: 0.20–30.28% silica, 0–1.80% alumina, 0.18–4.37% ferric oxide, 0–24.12% lime, 16.32–47.02% magnesia and 36.20–51.78% loss on ignition. S. KONDO

PATENTS

61. Fused zirconium oxide articles. A. L. DUVAL D'ADRIAN. U. S. 1,430,724, Oct. 3. ZrO_2 is finely ground, mixed with a binder such as starch or molasses and molded into tubes, blocks, crucibles or other articles, heated to dull redness between C electrodes and then heated by resistance to above 2500° to fuse the particles together. (*C. A.*)

62. Crucibles. M. BOÏBOUL. Brit. 179,928, May 5, 1922. Addition to 165,051. Crucibles for fusing refractory minerals are composed of a mixt. of the oxides of Zr, Y, Th and Er, suitable proportions being Zr oxide 60–80%, Y oxide 13–17%. Th oxide up to 10%, and Er oxide 5–20%. The Th oxide may be omitted. Rare earths, such as Ce oxide, may be added to the foregoing ingredients in proportions up to 20%. Ce oxide or Be oxide may be substituted for the Er oxide. (*C. A.*)

63. Refractory oxychloride cement. G. S. PEASE. U. S. 1,429,451, Sept. 19. A fire-resistant compn. adapted for molding into slabs is formed of a cellular mass of oxychloride cement the cells of which are filled with charred cork or other poor conductor of heat. (*C. A.*)

64. Electric furnace adapted for heating crucibles for metal or ceramic articles. I. RENNERFELT. U. S. 1,431,424, Oct. 10. The furnace has a central hearth on which a mass of comminuted graphite is placed and a ring-shaped hearth adapted for rotation about the central hearth. An electrode projects downward from the furnace roof into close proximity to the material on the central hearth. Cf. *Ceram. Abs.*, **2** [2], 20(1923). (*C. A.*)

65. Electric induction furnace for heat-treating or melting metals. W. ROHN. U. S. 1,431,686, Oct. 10. (*C. A.*)

66. Refractory composition. C. A. WHITE. Can. 225,123, Oct. 24, 1922. A non-recrystd. refractory material contains SiC, cryst. graphite and a carbonizing binder. A flux such as borax or sand and borax may be used to form a protective coating around the particles of the composition. (*C. A.*)

67. Refractory composition. C. A. WHITE. Can. 225,124, Oct. 24, 1922. A refractory material contains a chemically inert refractory material, cryst. graphite and a carbonizing binder such as tar or pitch. A flux such as borax or sand and borax may also be used to form a protective coating for the particles of the material. (*C. A.*)

68. Refractories. DENIS LOUIS. Can. 225,725, Nov. 7, 1922. A porous refractory material contains 30 parts of pure rich refractory earth contg. 70–80% sand, 30 parts MgO, 25 parts light earth contg. 80% sand and 5 parts sawdust. (*C. A.*)

69. Refractory material for zinc retorts. W. F. ROSSMAN. U. S. 1,424,120, July 25. A refractory material for manuf. of retorts is formed of plastic clay, finely pulverized SiO_2 and ground grog about equal in amt. to the SiO_2. (*C. A.*)

70. Gas-fired pottery kiln. A. M. DUCKHAM. U. S. 1,423,408, July 18. (*C. A.*)

71. Silica brick. O. REBUFFAT. U. S. 1,420,284, June 20. Silica brick of very nearly const. vol. and of a d. of 2.27–2.30 is prepd. by adding a phosphate, *e. g.*, Ca phosphate, contg. P_2O_5 to the amt. of 0.45% of the SiO_2 used, and heating to 1300–1350° for 8 hrs. to transform quartz into allotropic forms of SiO_2 of lower d. (*C. A.*)

72. Electrical resistance material. F. EICHENBERGER. U. S. 1,420,980, June 27. A paste is formed of finely divided Si carbide, $CaCO_3$, Fe oxide and graphite, molded and embedded in sand and burned out of contact with air. (*C. A.*)

73. Insulating cement. A. S. ELSENBAST and W. L. JORDAN. U. S. 1,421,192, June 27. A heat insulating cement adapted for covering walls is formed of diatomaceous earth 80, clay 10 and starch 10%. (*C. A.*)

Abrasives

74. Artificial corundum. H. A. Richmond and R. MacDonald. Can. 220,855, July 11, 1922. An abrasive material contg. less than 0.6% Ti, 0.5–2% SiO_2 and 0.3–2% FeO is produced by melting impure Al_2O_3 substantially free from TiO_2 in the presence of Fe and reducing part of the SiO_2 and FeO without materially reducing the TiO_2, then allowing the mass to cool slowly. See *Ceram. Abs.*, **1** [10], 255(1922).

75. Alumina from low-grade bauxite or clays. R. S. Sherwin. U. S. 1,422,004, July 4. A sintered unfused alumina, silica-lime-soda mixt. obtained from bauxite or clay, lime and Na_2CO_3, NaOH or NaCl is leached to dissolve Na aluminate; this soln. is heated under pressure to ppt. SiO_2 and alumina is recovered from it. (*C. A.*)

Stoneware, Whiteware and Porcelain

76. The unique development of modern chemical stoneware. Percy C. Kingsbury. *Chem. and Met. Eng.*, **27**, 1226(1922).—An acct. of the progress made during recent years in the manuf. and use of chem. stoneware. The type of clay, its prepn., and treatment of the ware during manuf. are described. The phys. and chem. properties of this type of ware are given. The writer discusses the extending uses and the probable future of this interesting and useful product. R. R. Danielson

77. The white clay industry in the vicinity of Langley, S. C. W. M. Weigel. U. S. Bureau of Mines, Serial No. 2382. The methods of mining and preparing white clays for market in this vicinity are described. Analyses of representative clays (sedimentary kaolins) are given. The clays are well adapted for use in paper stock, for which they are mainly used, and in pottery and china ware, without washing. R. R. D.

78. Pottery making in the Blue Nile. H. A. MacMichael. *Sudan Notes and Records*, April–July(1922).—The manuf. of vessels which he describes are the "Burma" or pots for carrying and storing water; and the water-jars used for the "Sagias" or water-wheels. The implements used are a roughly smoothed lump of stone the size and shape of a penny bun, and an oblong, slightly concave, river shell, which, if unprocurable, can be replaced by a fragment of dry water-melon husk. With these the lump of clay is kneaded with donkey's dung; is beaten into shape, and smoothed. The industry of making the "Sagia" jars is not originally found in Sudan; but is rather Nubian and Riverian. O. P. R. O.

79. Standardization of filter presses. Anon. *J. Soc. Chem. Ind.*, **41**, 210–11R (1922).—Revision of the preliminary report of the joint committee of the Brit. Chem. Manufacturers and Chem. Plant Manufacturers Assocs. A standard design of 48 in. chamber press and 48 in. plate and frame press has been added, with feed in an external central top lug, and wash outlet cocks on upper corners. Dimensions of rubber joint rings (grommets) and grooves are standardized. Minor changes are made in the rim of all plates, the rim of center feed channel for chamber presses, and dimensions of passages. Standard identification marks are suggested. W. L. B. (*C. A.*)

80. Note on the cause of the "splitting" of a pottery body. M. B. Craven. *J. Soc. Chem. Ind.*, **41**, 329–30T(1922).—In making ring supports for incandescent gas mantles trouble was encountered in splitting or splintering off. English bodies were compared with a satisfactory Germany product. Chem. analyses were about the same. The German rings showed no large content of MgO although they were sold under the name "Magnesia." Porosities were about the same—10–13%. Sections examd. under a magnification × 30 showed the marked superiority of the German ware, fine grained, homogeneous and free from laminations or cracks, in contrast with irregular grains, imperfect cohesion and striations in the English rings. The German body analyzed SiO_2 66.25, Al_2O_3 31.93, Fe_2O_3 0.72, P_2O_5 1.03, CaO 0.03, MgO 0.70, ign. loss 0.22%, alk. very low. C. H. K. (*C. A.*)

81. Modern handling methods in the manufacture of electrical porcelain. G. L. MONTGOMERY. *Chem. Met. Eng.*, **27**, 59–62(1922).—The porcelain plant of the Square D Co., Peru, Ind. is described. The complete handling system is described. Hand lift trucks, belt conveyors and gravity conveyors are used. Cf. *Ceram. Abs.*, **2** [1, 2], 56.
C. H. K. (*C. A.*)

PATENTS

82. Process of manufacturing ignition-plug and other refractory porcelains. SHINTARO NIIMURA. Japan 41,540, Jan. 27, 1922. Ignition-plugs, porcelain crucibles and evapg. dishes are formed by casting slips which have previously been kept at reduced pressure by means of a vacuum pump to drive off the air or other gases contd. in them. The slips may, at the same time, be heated or boiled, under constant stirring or not.
S. KONDO

83. Process of manufacturing heat-insulating wares. SHINSAKU NAGASAKI. Japan 41,666, Feb. 6, 1922. Stoves, small portable furnaces and similar vessels are formed with a stiff-plastic body which has been prepd. by mixing suitable amounts of clay and slaked lime to powder or fine grains of coal-cinder. They are fired in a Japanese roofing-tile kiln.
S. KONDO

84. Method of making wares of stones. YUICHI SHINAGAWA AND SEIZABURO YOSHIZAKA. Japan 43,361, Aug. 29, 1922. Engraved wares of stone are heated, in the access of air and flame, after they have been coated with an oil. The treatment makes their texture more distinct or changes their color, and increases their hardness.
S. KONDO

85. Ceramic compositions. L. A. CORDENOT. Brit. 177,160, March 14, 1922. Grains of natural or artificial corundum, or composite artificial aluminates melted in the elec. furnace are incorporated in ceramic compns. (*C. A.*)

86. Porcelain. F. H. RIDDLE. Brit. 177,553, Sept. 23, 1920. Clay is mixed with an alk. flux and sillimanite or materials adapted to interact to form sillimanite and the mixt. is fired so as to produce sillimanite and a glassy matrix in which practically all the free silica is dissolved. The clay may be kaolin with or without an admixt. of ball clay. The flux may be previously prepd. by firing a mixt. of alk.-earth oxides, introduced as talc, magnesite, whiting, dolomite or the like, and clay, with or without flint. Alternatively these ingredients may be mixed with kaolin and alumina, which react to produce sillimanite, and the operation carried out in one stage. Final product preferably contains 60–85% of sillimanite and 1.5–3.0% of alk. earths. Examples of proportions are given. (*C. A.*)

87. Porcelain. C. C. TREISCHEL. Can. 220,737, July 11, 1922. An elec. insulating material consists of a fired mixt. of clay 219, SiO_2 35, feldspar 144 and beryl 130 parts. (*C. A.*)

Art and Design

PATENT

88. Process of under-glaze coloring. DAIGORO FUKUOKA. Japan 43,176, July 31, 1922. Numerous shots of clay or other substances are soaked in wax which has or has not been mixed with pigment, are filled in a vessel so as to embed pottery body in them. By warming the whole vessel, the wax adheres to the surface of the body. The body may then be covered with a net which has previously been soaked in wax, colored with pigment or not, and warmed again. Then the body is painted with under-glaze color and fired in a kiln.
S. KONDO

Heavy Clay Products

89. On the absorption-test of common brick. SEIJI KONDO AND MASARU NAKAO *J. Jap. Cer. Assoc.*, **363**, 527–51(1922).—Elaborate experiments on the methods of

testing water absorption of common bricks have been worked for the National Committee on Industrial Standards. Proposed method for absorption-test. The test bricks shall first be weighed and then dried in an air bath at a temperature of 125° to 135°C for 2 hrs. After removing from the drier they shall be reweighed at once. If the second weight closely checks the first they shall be considered dry, but if it does not check the latter they shall be replaced in the drier and dried an additional 2 hrs. If the third wt. checks the second they are considered dry. In the case of doubt the bricks should be subjected to further 2-hr. drying treatments until check wts. are obtained. After the dry wt. is obtained, the bricks shall be cooled to room temp. and laid flat in a vessel. The bricks shall then be submerged in water which is one cm. deep, and the water-level shall be kept constant for 24 hrs. Then more water shall be added to the vessel so as to immerse the bricks entirely in it, their upper surfaces being 3 cm. below the water-level. Keep it for further 24 hrs. Then the brick shall be reweighed after surplus water has quickly been wiped from their surfaces with a wet cloth which has been wrung hard. All weighings shall be read to the nearest gram. S. KONDO

90. Burning roofing tile. ANON. *Brit. Clayworker*, **30**, 279–80(1922).—Tile burned in continuous kilns of suitable design are equally as good as those fired in periodic kilns and only $^1/_3$ to $^1/_2$ of the fuel is used to fire continuous kilns as compared with periodic kilns. Firms who have used continuous kilns for roofing tile may be divided into 3 groups as follows: (1) Those who have found continuous kilns satisfactory, (2) Those who have failed to get good results, and (3) Those who get good results at times but not sufficient to satisfy them. The two last groups may be divided into those whose clay is unsuitable for use in continuous kilns and those who obtain good results except for a kiln of unsuitable design. In most cases where the continuous kiln has been properly tried and found to be a failure, the fault is due to using too short a kiln, *i. e.*, one with too few chambers. Tile are more tender than brick and must be fired slower. The following schedule is employed for burning: smoking 3 days, preheating 5 days, full fire 3 days, cooling 5 days, and setting and drawing 2 days. In order to get an output of one chamber per day, it would require 18 chambers and if an additional day is devoted to preheating and another to cooling it will require a 20 chamber kiln. A chamber 14 ft. square and 8 ft. 6 ins. high will hold 4000 bricks and about 16,000 tile. Actually much narrower chambers are used, some being only 7 ft. wide so that the normal output is only 2000 brick and 3000 tile per day. By using a kiln twice the usual length it is possible to increase the rate of fire travel in the same proportion. This is done in Bührer's kiln with excellent results. Continuous kilns of the down-draft type appear to be excellent in every way for roofing tile. They are more costly to build than the simpler continuous kilns but are under better control and provide a more uniform heat. There are a good many continuous kilns which are unsuitable for roofing tile and there are also some clays which are more difficult to fire in continuous kilns than others.

H. G. SCHURECHT

91. Brick for forges and annealing furnaces. ANON. *Brit. Clayworker*, **31**, 154–5(1922).—Brick for the sides and top should be resistant to spalling while those on the bottom should be resistant to slagging action. The most suitable brick are grog fire brick. Silica brick fail because they are not resistant to spalling while special refractories are too expensive. Since these furnaces are only heated to a bright red heat No. 2 fire brick are amply refractory. The roof and sides should be built of coarse textured porous brick and must be well burned to a constant volume. Hand-made fire brick are generally preferred to those pressed in machines as the latter are usually denser and consequently not so resistant to sudden temp. changes as the hand made brick. The hearths of furnaces are very variable in temp. which is liable to change suddenly, so that resistance to sudden temp. changes is of prime importance. Resis-

tance to abrasion from the iron to be heated and corrosion from the scale and fuel are equally important. The fire brick for the hearth should therefore be fine in texture, rather dense on the surface with a porous interior. Even for the hearth it is seldom necessary to use fire brick of high refractoriness, strength being a more important property. Machine-made fire brick are quite satisfactory for the hearths of forges as they have a close-textured surface resistant to slags, while their interior is porous. H. G. S.

92. The occurrence of vanadium in ceramic raw materials and ware and its effect upon the fusibility as well as the color and formation of scum on a pure kaolin and a brick clay. O. KALLAUNER AND I. HRUDA. *Sprech.*, **45**, 333–5, 345–9(1922).—A large number of minerals contain V in small amts. and among these are clay. Seger pointed out that KVO_3 often causes a scumming and yellow discoloration on brick clays. A study was made of the effect of V_2O_5 on the fusion of clays, on the discoloration of clays and scumming. It was found that V_2O_5 in small amts. does not affect the fusibility of kaolin but in larger amts. acts as a strong flux as is shown below:

Kaolin	100	99	95	90	80	60	40	20	0
V_2O_5	0	1	5	10	20	40	60	80	100
Fusion cone	35	34	33	32	30	15	5a	08a	675°C

The V_2O_5 causes a yellow discoloration when present in quantities as low as 0.1%. This discoloration may be partly reduced by the addn. of $BaCO_3$ or $Ba(NO_3)_2$. As low as 0.001% V_2O_5 may cause scumming in a clay. This scumming may be reduced by firing with a reducing kiln atmos. and by the addn. of Ba or Ca compds. as is shown below. All tests were made on a mixt. of 99% kaolin and 1% V_2O_5 and the amt. of sol. V_2O_5 which is given below in mgs. after the diff. treatments was used to compare the diff. treatments

	No treatment	2 equivs. 5% $BaCO_3$	2 equivs. 5% $CaCO_3$	2 equivs. 5% $PbCO_3$	2 equivs. 5% $MnCO_3$	2 equivs. 5% $BaCO_3$	1 equiv. $Ba(NO_3)_2$
Dry	0.591	.....	0.542	0.219	0.443	0.223	0.034
OXID.							
500°C	0.243	0.025	0.490	0.132	0.204	0.024	0.048
700°C	0.021	0.098	0.141	0.014	0.021	0.023	0.036
900°C	0.076	0.115	0.258	0.049	0.103	0.051	0.055
1100°C	0.095	0.080	0.063	0.022	0.084	0.013	0.058
REDUC.							
500°C	0.143	0.012	0.400	0.023	0.199	0.024	0.048
700°C	0.046	0.026	0.068	0.029	0.116	0.026	0.029
900°C	0.048	0.006	0.035	0.016	0.064	0.021	0.020
1100°C	0.078	0.069	0.060	0.009	0.017	0.016	0.066

H. G. SCHURECHT

PATENTS

93. Process of manufacturing rough-surfaced architectural pottery. ICHIRO YOKOI. Japan 43,328, Aug. 23, 1922. Green bodies made of feldspar, granite and bog iron ore are put in a sagger, leaving small spaces between them. The sagger is then filled with powder of calcined quartz. By firing it to a temp., a little below the m. p. of the body, mottled wares with rough surface are obtained. S. KONDO

94. Prevention of efflorescence on bricks, etc. E. C. DE MEJER. Brit. 177,990 March 31, 1921. A compn. applied with a brush to brick, mortar, and plaster walls to prevent efflorescence consists of a mixt. of 1 cwt. of Burgundy pitch and 9 gal. of turpentine contg. in soln. 36 oz. beeswax or other wax. Half of the turpentine is added to the melted pitch at a temp. of 290–300°F, and the remainder after cooling to 100°F, or lower. (*C. A.*)

Glass

95. Study of glass. (Report No. 3.) KIYOHIKO HAGIWARA, KAN-ICHI MORIMOTO, KIYOSHI UEDA AND TAITARO HIRAOKA. *J. Jap. Ceram. Assoc.*, **362**, 457–488(1922).—This paper is a continuation of the Report No. 1, in which the authors attributed the cause of dimness of mirrors to minute spots on the surface of glass. (1) *Exudation at high temps.*—When a piece of window-glass was heated to 350–600°C for 1–2 hours in an elec. furnace, it was covered with minute particles which increased in amt. with the time of heating. They grew rapidly at 650° and disappeared almost completely when it was heated at temps. over 800°. It was observed that their amts. diminish in repeating the process, if they are wiped out every time, and also that their growth ceases completely or nearly so after the minute particles have once been erased with a piece of wood or steel. (2) *Exudation at ordinary temps.*—Similar minute particles appear also at ordinary temp., though it requires much longer time, usually more than 3 days. They must not be confused with the products of weathering. They grow uniformly scattered, in dendritic crystals or groups, the latter two aggregates being probably caused by the atm. moisture. (3) *The nature of the exuded substance.*—The substances, exuded at ordinary or higher temps., are hygroscopic and form hydrated crystals which sustain efflorescence as days pass. Microscopic examns. of these substances before and after treating with hydrochloric acid or calcium chloride, indicate that they are mainly sodium silicate, sometimes containing sodium sulphate. (4) *Amt. of the exudation.*—The amts. of the substances, exuded from window-glass when new specimens were heated at 480–520°C in a muffle-kiln for 1, 5 and 10 days, were 0.0035%, 0.0052% and 0.0088% of glass respectively. (5) *Exudation on the surface of glass-cylinders.*—Experience in the cylinder-process of mfg. window-glass tells us that the drawn cylinder is sometimes covered with minute particles, though it happens only rarely. Some cylinders which broke in drawing have shown striped growth of the particles which is more common with window-glass made by Fourcault's or Colburn's process. Such a glass is very brittle and breaks usually in leer. The authors believe that the minute particles are exuded from glass owing to its unstable state of equilibrium. (6) *Exudation in pores.*—Some pores in glass have much exudation while others show it only after heating at a temp. over 400°. (7) *Glass-mirrors.*—Glass for good mirrors must be polished to remove the exudation baked on its surface or has to be examd. with vitroscope before it is silvered.

S. KONDO

96. Coloring glass with nickel. KITSUZO FUHA. *J. Jap. Cer. Assoc.*, **361**, 430 (1922).—Numerous batches were melted to find the coloring action of nickel and its compds. on various glasses with or without addition of oxidising or reducing agent. Conclusions are: (1) Nickel oxide gives purple to potash glasses and gloomy brown to soda glasses, though these effects become less distinct as the amount of nickel oxide increases; (2) The difference in the bivalent metal of a glass-formula does not affect the color materially except barium which has peculiar effect on the color produced by nickel oxide; (3) In boro-silicate glasses, nickel oxide produces pinkish purple; (4) Metallic nickel or nickel carbonate may be used instead of nickel oxide; (5) The presence of oxidising agent (potassium nitrate), reducing agent (potassium tartrate) or arsenious acid in batches does not affect the color given by nickel oxide.

S. KONDO

97. Glass industry. W. E. S. TURNER. *Chem. Trade Jour. & Chem. Eng.*, **71**, 707(1922).—At a recent meeting of the Soc. of Glass Tech. at Sheffield University, Prof. Turner gave a short acct. of his visit to Czecho-Slovakia to investigate the position of the glass indus. He states that the indus. on the continent has not made anything like the strides it has in Eng. The Bohemian glass industry is living largely on its traditions and machinery for mfg. scarcely exists, the work being carried on largely

by hand as it was before the War. As a result Eng. in many methods, from a technical point of view, leads the European continent. O. P. R. O.

98. Clouding of table-working glass tubing in the blowpipe flame. M. W. Travers. *J. Soc. Glass Tech.*, **5**, 61–70(1921).—In articles made in the blowpipe flame from glass tubing a faint opalescent ring occasionally appears immediately adjacent to the glass actually melted. The effect was only obtained with coal gas when O was in excess, and in the oxy-hydrogen flame when S compds. were introduced. The amt. of clouding varies with the time of heating. A glass jet heated externally by a H flame and conveying a current of SO_2 clouded internally on cooling. From Nernst's equation T. calcs. the dissoc. pressure, in atms., of the gases CO_2, SO_2, and SO_3 in contact with the solid phases Na_2CO_3, Na_2SO_3, and Na_2SO_4 to be $P_{SO_2} = 40$, $P_{SO_2} = 3.0$, $P_{SO_3} = 10^{-9}$ at 700°, and with the liquid phase, glass, present the values will be raised somewhat. Hence CO_2 will not attack glass, and SO_2 at 1 atm. pressure will only attack at a temp. some distance below the softening point. As, however, the SO_2 content of the burned gases at the edge of the flame varies from 2×10^{-5} atm. upwards, if at 700° only 0.01% of this were converted into SO_3, the pressure of the latter would be 2×10^{-9}. Thus it appears probable that there is, within the variation of the limits of the S content of town gas, an amt. which, if exceeded, would cause sufficient pressure of SO_3 at the edge of the flame to give solid Na sulfate (or less probably silica).

J. S. C. I.

99. Heat balance of a plant consisting of an air-steam blown gas producer and a glass tank furnace. M. W. Travers. *J. Soc. Glass Tech.*, **5**, 166–83(1921).—A detailed analysis of the combustion and melting processes, with consideration of heat losses, gave the following data: In a tank working at 1400°, with regenerators for preheating gas and air to 600°, there would be a fuel efficiency of 35% (the remaining 65% being lost outside the furnace), while, of this energy, 26% would be lost through the furnace walls, and 9% only would be used in melting glass. The coal consumption per ton of glass would be 0.94 ton. In a similar tank where gas and air were preheated at 800° the fuel efficiency would be 45%, of which 12% would be used for melting glass, and 0.73 ton of coal would be used per ton of glass. Finally with air and gas preheated to 1000° the fuel efficiency would be 55% (44.5% used for melting glass), the coal consumption per ton of glass being 0.60 ton. J. S. C. I.

100. A study of brown glass milk bottles. A. W. Bitting. *Glass Industry*, **3**, 157(1922).—It was found that when milk was exposed to the sun simultaneously in brown and clear bottles that the contents of the brown bottles were heated from 3° to 5° higher. The quantity of bacteria and acidity was increased so that the milk soured much more quickly in the brown bottles. The bacterial increase and change in compn. seemed to be more marked than could be accounted for by the difference in temp. alone. Clear glass evidently permits the strong light to exercize some inhibiting effect on the organisms while the brown has a less restraining influence. Milk when exposed to a strong light may acquire a tallowy taste, and sometimes a rich looking milk will take on a dead or chalky appearance. On these two points the amber bottle showed an advantage over the clear glass. J. B. P. (*C. A.*)

101. Heat balance for a 25-ton glass tank. F. J. Denk. *Glass Industry*, **3**, 109–11, 135–7, 151–3(1922). J. B. P. (*C. A.*)

102. Solubility and decomposition in complex systems (glass and ceramic ware). G. W. Morey. *J. Soc. Glass Tech.*, **6**, 20–30(1922).—M. discusses first the 3-component triangular diagram H_2O–K_2O–Cr_2O_3, points on the side of the triangle representing binary mixts. and points inside ternary mixts. (cf. Schreinemakers, *Z. physik. Chem.*, **55**, 71(1906)). The diagram may be used to differentiate between compds. sol. in H_2O, *e. g.*, $K_2Cr_2O_7$ and those decomposed by it, *e. g.*, $K_2Cr_3O_{10}$. A similar diagram for H_2O–

K_2O–SiO_2 at various temps. up to 1000° was then studied. It is stated that the first action of H_2O at ordinary or moderate temps. on glass or ceramic ware is one of decompn., followed by the soln. of more or less of certain of the decompn. products. Tests on the durability of such silicates are rarely carried to completion and are thus really detns. of the rates of decompn. under more or less definite conditions. The effect of variation of conditions is dealt with and the paramount importance of rigidly defining these is shown. G. S. F.

103. Apparatus for controlling annealing of glassware and annealing without pyrometers. F. Twyman. *J. Soc. Glass Tech.*, **6**, 45–68(1922).—A rod of glass of the same compn. as that to be annealed is put under a strain producing deformation and is placed in the annealing chamber alongside the other articles. In two forms of the app. the extent of the failure of the rod to recover its usual position on removal is used to det. the extent of annealing, and in two other forms an additional small stress is applied in such a direction as to tend to increase the deformation; the point at which, strain having been released, the deformation begins to increase continuously, is taken as the annealing point. A method of using one form for detn. of the actual annealing temp. is described. An appendix gives a summary of formulas governing annealing, *e. g.*, variation of viscosity with temp. G. S. F.

104. Critical examination of methods commonly used in determining durability of glass. W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 30–45(1922).—Four methods of test are considered. (1) Surfaces of glass vessels. It is not easy to arrange that a given vol. of reagent always acts on a definite area, especially when the reagents are boiling or agitated. (2) The use of plates or slabs of glass has the advantage that the area in contact with the reagent or its vapor is readily controlled. To obtain good results the surfaces should be ground and polished. (3) The use of powd. glass permits results to be obtained quickly by reason of the increased surface exposed, though for comparable results it was necessary to adopt a fixed grading of grain size (*e. g.*, 20 to 30, or 40 to 50 mesh), and to wash off any fine dust with alc. before the detn. (4) The autoclave test (Baillie and Wilson, *Ceram. Abs.*, **1** [10], 260(1922)) with water is not very satisfactory, since its results are not always in harmony with those given by water at ordinary pressures. The danger of trusting to loss in weight of a glass as a measure of attack is shown by examples in which samples actually gained weight owing to hydration. The detn. of the alkali extd. is stated to be easily possible only when water is the corrosive agent. The most accurate method, though slowest, is the detn. of the total matter extd. The need for a standardized method of test is emphasized. G. S. F.

105. Action of various analytical reagents on chemical glassware. W. E. S. Turner and T. E. Wilson. *J. Soc. Glass Technology*, **6**, 17–20(1922).—The tests were made on 3 types (two English, one French) of chem. glassware; in most cases the soln. was kept in contact with the glass for 3 hrs. at 100°. HNO_3 (d. 1.2), and $2N(NH_4)_2S$ soln. had but little action on the glasses, but they were attacked to an appreciable extent by 0.5 *N* and 0.25 *N* Na phosphate soln. The French glass was attacked to a greater extent than were the English glasses by the Na phosphate solns., while there was but little difference between the 3 types as regards their resistance to alkali hydroxide solns., showing that the corrosive action of the alkali salt solns. was not due entirely to their alky. J. C. S. (*C. A.*)

106. Re-annealing of glass. W. A. Whatmough. *J. Soc. Glass Tech.*, **5**, 44–54 (1921).—The annealing of a glass prevents the development of strain only, but re-annealing, by heating glass to its softening point, releases strains already present. High ring strain is produced in articles such as specimen tubes made from glass tubing by machines with high velocity burners, and to remove this W. constructed a re-annealing oven which is very successful. In its present form it consists of a tunnel lehr, 9 in. sq.,

shaped like an inverted siphon, the mouth of the short entrance limb being at a lower level than that of the longer exit limb. The central horizontal portion is a fire clay muffle, heated by two rows of burners which can be accurately adjusted. The bottom of the tunnel, on which an endless chain tray track runs, is of cast iron, and the lagging is of slag wool between metal plates. In both limbs are draw-off valves for hot gas, and nine pyrometers are inserted. The track can be drawn through at varying rates. To prevent the cracking of long tubes by "steaming" an oven is constructed over the hot end of the long limb to give articles a preliminary warming. W. follows the conditions of the critical annealing curve as worked out by English and Turner (*C. A.*, **12**, 2240). J. S. C. I.

107. Examination of glass by polarized light. S. NAKAMURA. *J. Soc. Glass Tech.*, **5**, 57–61(1921).—N. describes a strain tester for optical glass slabs in which a sheet of black glass is used as polarizer, and is so fixed that, with polarizer and analyzer set with crossed planes, the slab is in the "diagonal position" when laid horizontally between. The degree of strain is indicated by the amt. of double refraction at the center of the slab, and this is measured by trial, a series of mica films of known retardation being used to obtain total extinction. J. S. C. I.

108. The melting of potash feldspar. G. W. MOREY AND N. L. BOWEN. *Am. J. Sci.*, **4**, 1–21(1922).—Pure synthetic orthoclase was prepared by crystg. a glass of the compn. $KAlSi_3O_8$ in a bomb with H_2O vapor. It was found that above 1170° this pure orthoclase decomposed into a liquid and leucite, the leucite becoming more apparent with increased temp. up to 1530°, where it disappeared. The significance of this fact to petrogenic theory is discussed. E. F. H. (*C. A.*)

109. Effect of magnesia on the resistance of glass to corroding agents and a comparison of the durability of lime and magnesia glasses. V. DIMBLEBY, C. M. M. MUIRHEAD AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 101–7(1922).—The series tested ranged from $2Na_2O.6SiO_2$ to $Na_2O.CaO.6SiO_2$ and $2Na_2O.6SiO_2$ to $0.9Na_2O.1MgO.6SiO_2$, replacement of R_2O by MO being made in each case in ten successive steps. The resistance to boiling water, const. boiling HCl, $2N$ NaOH, and $2N$ Na_2CO_3 was detd. The magnesia glasses were superior to lime glasses over the whole range when water was the corroding agent, but were distinctly inferior to lime glasses in resistance to NaOH or Na_2CO_3. Na_2CO_3 was more corrosive to the magnesia glasses than was NaOH. Lime glasses were superior to magnesia glasses in resistance to HCl above the value MgO = 3.5 mols. %, but below this the substitution of MgO for Na_2O was more effective in improving resistance than the use of an equiv. amt. of CaO. G. S. F.

110. New plant of the United States Sheet and Window Glass Company at Shreveport, Louisiana. J. B. KRAK. *Glass Ind.*, **3**, 171–80(1922); illus. J. B. P. (*C. A.*)

111. Examination and extension of Zulkowski's theory of relation between the composition and durability of glasses. W. L. BAILLIE. *J. Soc. Glass Tech.*, **6**, 68–101 (1922).—Zulkowski (*Chem. Ind.*, **22**, 280–92; **23**, 346–59) connected the no. of mols. of simple silicates present in a glass per hundred mols. of double silicates with the durability of the glass, arguing that the simple silicates were the prime causes of instability. This theory gave good results with the plain potash-lead and soda-lime glasses, but samples contg. appreciable amts. of the R_2O_3 oxides were not considered. B. has studied 27 optical glasses, graded as unaffected, appreciably affected, or seriously affected by a filming test, by Zulkowski's method and shows that it fails with the glasses contg. R_2O_3 oxides. After quoting evidence in favor of the combination between Na_2O, Al_2O_3, and SiO_2 and of the beneficial effect of Al_2O_3 and B_2O_3 on the durability, the R_2O_3 oxides are regarded as forming silicates of the type $3MO.R_2O_3.xSiO_2$ and the remaining constituents as forming simple and double silicates as in the original theory. These com-

plex silicates are considered to be not inferior to the double silicates in durability. The general expression for the mol. percentage of simple silicates or "reactivity coeff." is developed as $(c-d)(c+d-3b)/(c+d)$, where a, b, c, d, denote molar percentages of SiO_2, R_2O_3, MO, and R_2O resp., for the usual conditions when $(c+d)>3b$. When $(c+d)<3b$ complex silicates with higher R_2O_3 content are regarded as being formed, and as being very stable, though excessive amts. of R_2O_3 may give unfavorable results, tending to devitrification and ready attack by alkali, or ready hydration in the case of B_2O_3. The theory can be regarded only as a second approximation, and while general durability can be predicted from the compn. of the glass, the behavior towards any particular reagent is uncertain. Further differences may be expected among different R_2O_3 oxides in equimolar proportions. Various tables of results are given in support of the theory. Sixty-five glasses were examd., and agreement in most cases was good. Values for "reactivity coeff." of more than 10 show an altogether unsuitable glass, of more than 5, unsuitable for chem. ware, while the value for good chem. ware is less than 3 and generally below 2. The acidity index of the glass, $a/(c+d)$, does not appear to be connected with the durability. Among the probable causes of discrepancies between the calcd. and observed results are insufficient "plaining" of the glass leading to incomplete formation of the double silicates and a corresponding excess of simple silicates, defective mfg. processes leading to cordiness and inhomogeneity generally, and reliance on a limited no. of tests to det. durability, and different methods of prepg. test pieces. The desirability of a varied range of tests for durability is stressed and B, in arriving at his results adopted the method of giving points to the glasses. Thus a no. was allotted to each glass in every test, indicative of its order of resistance to the agent employed. The sum of these numbers for a glass, divided by the no. of tests, gave its av. no. of "points" and these were the figures used in comparisons, as being the fairest and most impersonal. G. S. F.

112. Producer gas as fuel for the glass industry. C. D. Smith. *Nat. Glass Budget*, **38**, No. 18, 1, 16–7(1922). J. B. P. (*C. A.*)

113. The annealing of glass. H. W. Hess. *Glass Worker*, **41**, No. 51, 11, 27 (1922).—In making ware with automatic machines care is needed to prevent devitrification of the glass. The polariscope is of great assistance in securing proper annealing. J. B. P. (*C. A.*)

114. Boiler gage glass problems. H. W. Hess. *Glass Worker*, **41**, No. 52, 11 (1922). J. B. P. (*C. A.*)

115. Testing gage glasses. H. W. Hess. *Glass Worker*, **42**, No. 1, 11, 29(1922).—Various methods are described briefly and weaknesses noted. A dipping test from hot Hg to cool water is considered most satisfactory. J. B. P. (*C. A.*)

116. Copper ruby glass. H. Kühl. *Sprechsaal*, **54**, 383(1921); *J. Soc. Glass Tech.*, **6**, 8a–9a.—One of the oldest and most interesting works on Cu ruby glass was that by P. Ebell (1870), who, although writing before colloidal chemistry was understood, drew sound conclusions as to the cause of the color. The prepn. of Cu ruby, however, was, on the whole, not so well understood as that of Au ruby. As the two were of similar nature, the amt. of the metals used to produce the same intensity should not differ widely, but whereas, according to Müller, 1 part of Au per 50,000 parts of glass gave a bright red color, the amt. of Cu needed was uncertain, and many views were incorrect. Randau, for instance, had stated that the weight of Cu should be 2% of that of the batch. By the use of methods similar to those for prepg. gold ruby, K. had obtained the color by the use of 0.02% of Cu. Haller prepd. a beautiful ruby from the batch: sand 100, potash 30, soda-ash 2.5, limespar 12, Cu sulfide 0.02, Na_2S 0.026, borax 0.024. A ruby batch patented in 1882 had the compn.: fine sand 2000, red lead 400, potash 600, lime 100, Ca phosphate 20, K bitartrate 20, Cu_2O 9, SnO_2 13. The

Cu here was only 0.40% of the weight of sand used. Randau used a much higher propn. in the batch: sand 100, soda 18, SnO_2 20, CuO 15, Fe oxide 10. In the manuf. of copper ruby, the batch should be one melting at not too high a temp. and allowing normal working, while the Cu salt should be easily reducible and very finely divided. The melt should be of a reducing character. In many failures the fault had been due to the use of a too strongly basic batch resulting in the production of crystals of Cu_2O, in which case a liver-brown color was obtained with incident light. H. G. (*C. A.*)

117. The application of self-luminous colored decorations in the glass and ceramic industries. O. PARKERT. *Sprechsaal*, **55**, 34(1922); *J. Soc. Glass Tech.*, **6**, 23a.—The prepn. of self-luminous paints, now coming into use in America and France, depends on the use of phosphorescence phenomena such as are associated with the sulfides of the alk.-earth metals, and of ZnS. In addn. to the sulfide, such as that of Ba, Sr, or Ca, an active metal is added in the form of a salt of Bi, Mn, or U. Further, a flux is needed, and is usually provided by a salt of Li, Na, or K. A mixt. which gives violet radiation is said to be obtained from 20 g. CaO, 5.5 g. S., 2 g. starch, 1 cc. Bi nitrate soln., 0.12 g. KCl, 0.14 g. NaCl. This mixt. is heated for a lengthy period in a muffle at 1200°. For yellow colors, one may use 100 g. $SrCO_3$, 100 g. S, 0.5 g. KCl, 0.5 NaCl and 0.4 g. Mn chloride. For a green color, Sr thiosulfate 60 g., U nitrate 6 g., and Bi nitrate 10–12 g.; while for a red color, $BaCO_3$ 44 g., S 6.5 g., Li carbonate 1.2 g., Na carbonate 0.04 g., Rb carbonate 0.5 g. may be used. The mixt. is heated to glowing and appears to be most efficient when cooled rapidly. It should have a fine white appearance. Before use it is subjected to the action of strong illumination, which may be sunlight, or an incandescent gas mantle, or a Hg vapor lamp. For glass or ceramic processes, the prepn. may be mixed into the liquid glass or applied as in the glaze to porcelain. It may also be applied as a paint or as a spray. H. G. (*C. A.*)

PATENTS

118. Non fragile glass. P. B. CROSSLEY. Brit. Pat. 152,780, July 22, 1919; *Ill. Off. Jour.* (Pat's.) No. 1668, p. 5676, Dec. 31, 1920. Non fragile glass, which can be rolled, forged, extruded, cast, etc., is made by dissolving in the dry state such silicate as micaceous or asbestos minerals in molten glass or a similar silicate. The glass, etc., is chosen so as to melt at a temperature below the temp. at which the hydrous silicate effloresces. If the product is to be machined an excess of mica, etc., should be present over the amount necessary to form a satd. soln. WM. M. CLARK

119. Sealing electrical conductors into quartz. SILICA SYNDICATE, LTD. Brit. Pat. No. 185,952. Sept. 7(1921); *Ill. Off. Jour. Pat's*, p. 4891(1922). Covers a seal for elec. conductors in vitreous vacuum vessels comprising two or more wires passed thru sep. holes in a vitreous plug, or thru sep. vitreous tubes, these being placed in an enclosing vitreous tube and the whole fused together. With sketches.

WM. M. CLARK

120. Process of manufacturing optical glasses. GENZO SHIMAZU. Japan 43,203, Aug. 1, 1922. Oxides of lead are prepd. by oxidizing lead-powder by means of natural oxidation or other methods without melting. They are used to compose batches for optical glass together with quartz, sodium carbonate, lime and other usual raw materials. S. KONDO

121. Improvement in boro-silicate glass. KITSUZO FUHA. Japan 42,161, March 31 (1922). The new glass has the following compn: Silica 66.0–67.5%, alumina 1.0–1.75%, soda 7.0–8.0% and boric anhydride 22.0–24.0%. The glass adheres more air-tightly to tungsten-wire, resists more sudden changes of temp. and resists weathering better than the already-known boro-silicate glasses. S. KONDO

122. Glass molds. R. L. FRINK. Brit. 183,582, April 26, 1921. Metal molds for glass working are made with a porous or finely pitted surface. Such molds may be

made from an alloy of Al or Cu with Cu, Ba, or Mg, the surface being rendered porous by treating it with an alk. soln. A suitable alloy contains about 2% of Ca or Ba. In making such an alloy, it is recommended that an alloy contg. 75% of Al and 25% of Ca, etc., be first prepd. at a temp. of 500–1100°, and that this be added in the required proportion to pure molten Al. For use the molds may be dipped in H_2O, paraffin oil, etc. (*C. A.*)

123. Alkali metal silicate production in blast furnaces. S. Peacock. U. S. 1,425,048, Aug. 8. An alkali metal silicate suitable for *glass making purposes* is made by igniting a charge of C, SiO_2 and Na_2CO_3 in a blast furnace and withdrawing the slag produced. (*C. A.*)

124. Furnaces containing melting pots or crucibles. J. U. McDonald. Can. 221,315, July 25, 1922. (*C. A.*)

125. Glass. F. M. Locke. U. S. 1,431,166, Oct. 10. Glass having a coeff. of expansion of not more than 0.0000035 and adapted for the manuf. of culinary or chem. ware is formed of SiO_2 78, B_2O_3 15, Na_2O 4, CaO 1, K_2O 1 and Al_2O_3 1%. (*C. A.*)

126. Glass. A. L. Duval d'Adrian. U. S. 1,430,725, Oct. 3. $MgBr_2$ 1/2–50, lbs. or other Br salt is added to a glass-forming compn. which may contain sand 1000, Na_2CO_3 360–380 and limestone 200–220 lbs. in order to eliminate greenish color due to Fe present in the materials used. (*C. A.*)

127. Continuous annealing furnace. M. Van Marle. U. S. 1,429,380, Sept. 19. Articles are carried through the furnace on an endless conveyor which passes through seals at both ends of the furnace. (*C. A.*)

128. Glass. E. C. Sullivan and W. C. Taylor. Can. 220,748, July 11, 1922. A glass having a linear expansion coeff. of more than 0.000012 and a hardness of 640° contains SiO_2 42, soda 19, potash 5, BaO 19, and Al_2O_3 15%. Cf. *C. A.*, **15**, 1608; **16**, 1644. (*C. A.*)

129. Glass. W. C. Taylor. Can. 220,441, July 4, 1922. A glass contg. SiO_2 B_2O_3 Li_2O and Al_2O_3 has a coeff. of expansion of less than 0.0000056. (*C. A.*)

130. Hollow glass articles. E. Frank. U. S. 1,420,996, June 27. A long clear glass tube is coated with opaque material at intervals preparatory to reheating and blowing to form incandescent lamp bulbs or similar articles. (*C. A.*)

131. Non-shatterable glass. O. S. Marckworth. U. S. 1,421,974, July 4. Assembled laminas of glass and celluloid are immersed in a soln. of fusel oil, camphor, and methyl salicylate at a temp. of 24–35° and the laminas are subjected to pressure together and more highly heated in the soln. (*C. A.*)

132. Melting glass. R. Good. U. S. 1,421,210–11, June 27. Mech. features. (*C. A.*)

Enamel

133. Something better in enamel smelters. H. E. Davis. *Chem. and Met. Eng.*, **27**, 1210(1922).—A description of a new type of enamel smelter, using oil as fuel. The general construction of the furnace and some data as to the cost of operation are given. R. R. Danielson

134. The development of industrial electric heating for low temperature enameling. W. S. Scott. *Trans. Am. Electrochem. Soc.*, **42**, preprint, 1922.—Early expts. are recorded which point out the great importance of adequate ventilation of an elec. enameling oven. During the drying of the enamel combustible gases are evolved and these must be withdrawn in such a way as to avoid explosions. The suspensions and arrangement of the heating units are discussed. Typical elec. oven installations of the automotive and typewriter industries are illus. and described in detail. Cf. *C. A.* **16**, 3263. C. G. F. (*C. A.*)

135. Enameling. N. Meurer. Brit. 179,216, Nov. 27, 1920. In enameling metal, ceramic, or other heat-resisting articles by spraying enamels, glass, or mixts. rich in quartz on to the articles by means of gases under pressure, the surface of the article is heated by the spraying jet to the fusing temp. of the coating material, and the flame that effects the melting and heating has a reducing action to prevent oxidation. A suitable construction is specified. (*C. A.*)

136. Enameling furnace. Takeo Nagasawa. Japan 39,806, Sept. 8, 1921. A muffle furnace in which materials are revolved during heating is specified. (*C. A.*)

Cement, Lime and Plaster

137. Storage and transportation of portland cement. W. F. Myers. U. S. Bureau of Mines, Serial No. 2377(1922).—See *Bull. Amer. Ceram. Soc.*, **1** [10], 264 (1922). R. R. Danielson

138. Working a lime-stone quarry. Pierre Prévost. *Rev. Mat. Constr. Trav. Pub.*, **157**, 189–91(1922).—At Louvières, Vitry-Le-François (Marne, France), 4,500 T. of lime-stone were blasted at one time by detonating 230 kgs. of dynamite set in four holes, 20 cms. in diameter, drilled 19 m. deep and 6 m. apart. Louis Navias

139. Tests on the double burning of lime, and the value of cements of high hydraulic index. F. B. Jeanneret. *Rev. Mat. Constr. Trav. Pub.*, **158**, 213–5(1922).—(1) Penetration tests in alk. sulphide solution are given for diff. types of pure binders, for tamped 1:3 mortars, and for untamped 1:3 plastic mortars. (2) Graphically and in table form are given the results of tests on lime burned directly to 1400° and on samples first fired to 1100°, then cooled, made into blocks, and fired to 1300–1400°. Chem. compns., and results on compression and tensile strengths for the cements are given. The only conclusion drawn is that binders of high hydraulic index show their max. properties when they have a $CaCO_3$ content of 72–75%. Louis Navias

140. Function of the laboratory in cement manufacture. J. C. Witt. *Cement Mill and Quarry*, **21**, No. 9, 31–2(1922).—From selecting the raw materials to turning out the finished product, cement manuf. which is essentially a chemical process, requires lab. control. J. C. W. (*C. A.*)

141. Some generalizations on the influence of substances on cement and concrete. J. C. Witt. *Philippine J. Sci.*, **17**, No. 10(1922); cf. *C. A.*, **12**, 1113; **13**, 895.—The final results obtained in a research started at the Bur. of Science, Manila in 1916 are given. The effect of NaCl, $ZnCl_2$, $CuCl_2$, $NaNO_3$, KNO_3, NH_4NO_3, Na_2SO_4, $ZnSO_4$, $CuSO_4$, $NaHCO_3$, and $KHCO_3$ has been studied. The 2700 tensile tests indicate that when cement is mixed with normal solns. of these salts the general effect is a slight decrease in strength, though in many cases there is an increase. J. C. W. (*C. A.*)

142. The remelting of acid blast-furnace slags and cement. Richard Grün. *Stahl u. Eisen*, **42**, 1158–67(1922).—The prepn. of Portland cement out of acid blast-furnace slag is possible by adding lime and clay to the hot liquid slag. The clay should be added before or with the lime. The addn. of lime up to the compn. of Port. cement is not necessary but may be limited to about 50%. R. S. D. (*C. A.*)

143. The effect of sulfur compounds on cement. J. C. Witt. *Philippine J. Sci.*, **17**, No. 10(1922); cf. *C. A.*, **12**, 88, 616; **13**, 3300; **15**, 1835.—The final results obtained in a research started at the Bur. of Science, Manila, in 1915 are given. Five-year neat and mortar briquets show little decrease in strength due to the presence of Na_2S in the mixing water in quantities up to 1 g. S^{--} per l. A max. decrease of approx. $^1/_3$ the strength results with 10 g. S^{--} per l. Three-year neat and mortar briquets made with cements contg. varying amts. of SO_3 show little difference in strength (up to 5% SO_3). Decided lowering of strength and in some cases disintegration, are caused by 9% to 10% SO_3 (in 5 of the 6 cements used). J. C. W. (*C. A.*)

144. The utilization of the waste heat of rotary cement kilns. J. Bied. *Chimie et industrie*, 8, 528–30(1922).—The amt. of heat carried away by the waste gases in the dry process is calcd. It is proposed to use this heat for generating steam. Installations at the plant of the Trinity Portland Cement Co. (*Rock Products*, No. 23, Nov. 5, 1921) and at the Leimen plant of the Heidelberg Portland Cement-Werke (E. Schott, *Ton-Industrie*) are described. Schott proposes a "compound kiln," consisting of a rotary for clinkering and a vertical for decarbonating by means of the waste gases (at 1300°) from the rotary. A certain amt. of coal would be required in the vertical kiln.
A. P.-C. (*C. A.*)

145. Industrial chemistry problem relative to the treatment of cement. (Influence of the addition of calcium chloride on the strength of Portland cement.) C. R. Platzmann. *Zement*, 11, 137–8, 151–3(1922); *Chimie et industrie*, 8, 614(1922); cf. *C. A.* 16, 2586.—$CaCl_2$ 2.4–5% was added with the water in mixing the mortar to hasten hardening and prevent cracks due to shrinking. The temp. of setting was detd. by means of Killig's app. Though this indicated only part of the heat generated, the relative temps. obtained were interesting. The tests were carried out with a com. cement and with a slag cement. The av. tensile and crushing strengths at the end of various periods of time and for various percentages of $CaCl_2$ are tabulated. The addn. of $CaCl_2$ improves the constancy of the vol. and increases the generation of heat during setting. Finally, the cement is less readily attacked by various gases which in the presence of water form H_2SO_3 and H_2SO_4. A. P.-C. (*C. A.*)

146. A Rumanian cement mill. P. F. Bagge. *Concrete* (Cement Mill Section), 21, 19–25(1922).—B. discusses the raw materials, fuel, labor, equipment and mfg. processes of the Tordaer Cement Works. J. C. W. (*C. A.*)

147. A study of conditions causing disintegration of cement under the "accelerated" test. A. G. Fleming. *J. Soc. Chem. Ind.*, 41, 300–2T(1922).—That the accelerated steam test on cement is unnecessarily severe and does not always indicate the quality of the cement has led to these conclusions from a series of expts.: (*a*) The chem. compn. of an av. Port. cement gives little guidance as to its possible behavior under the accelerated test. (*b*) Unsound cement stored under water shows a marked improvement compared with that stored in air, either dry or moist; the natural storage for cement, at any rate during hardening, is under water. (*c*) Mortars poor in unsound cement improve more rapidly than mortars rich in unsound cement. There is thus little danger of disintegration of a water-stored concrete made from what are ordinarily termed "poor" cements. (*d*) Mortars in practice do not exhibit the weakness of their neat cement. (*e*) Mortars and concretes are improved by water-storage; concrete should be kept moist, at any rate until completely set. The disruptive force exhibited in the accelerated test is due principally to the free lime incorporated in the clinker particles and this force is not discovered except by rapid hydration. That the combination of the alkali bases with CO_2 from the air and S from the sulfides of the clinker may be also responsible for unsoundness is indicated from the expts. Fine grinding of raw mix to insure more intimate combination of the elements has eliminated much of the danger of unsoundness. C. N. W. (*C. A.*)

148. Electric cement. Anon. *Rev. ing. index tech.*, 29, 155–7, 197–8(1921); *France-Belgique*, 1, 71–2, 199–200(1922).—"Electric cement" is an aluminous cement manufd. in the elec. furnace. The essential component is $Al_2O_3.CaO$ or the eutectic $3Al_2O_3.5CaO$. The hydraulic index is generally above 1. The apparent d., with a degree of fineness such that 5% remains on a sieve of 4,900 meshes per cm^2., is not over 1. When tested hot with LeChatelier cylinders it does not swell, and its contraction on setting is the same as that of ordinary cement. It is not decomposed by the sulfates of the alkalies or alk. earths or by sea-water; it hardens rapidly; with 300 kg. of cement

to 1 m.^{3} of sand, the strength after 48 hrs. is more than double that of a similar mixt. of artificial Port. cement after 90 days. A. P.-C. (*C. A.*)

149. Process of burning pulverized fuel in which Portland cement is obtained as by-product. Tsuneichi Fujiyama. Japan 43,420, Sept. 8, 1922. Lime and small amts. of quartz or other similar subs. are mixed to pulverized fuel in such a propn. that they compose Port. cement with the ashes of the fuel. The pulverized mixt. is burned with air-blast to heat boilers or other app. and to produce cement-clinker at the same time. S. Kondo

150. Marble-cement. Kihichi Nakamura. Japan 43,347, Aug. 28, 1922. Pieces of glass or pattern-plates of various shapes are scattered on a base-plate which has previously been coated with celluloid or glue and has a frame on it. A colored mortar composed of sodium silicate, Port. cement, coloring matter and water is poured on the plate as thick as the glass-pieces or the pattern-plates. They are then picked out and similar mortar of different color is poured in their places. Then cracks are formed in the mortar by inserting a spatula to the surface of the film and moving it at places. The cracks are now filled with similar mortar of another color. The artificial stone, thus obtained, is soaked in the soln. of sodium silicate and is then polished. Marble, granite and other natural rocks can be imitated by the process. S. Kondo

151. Process of manufacturing paving material. Komakichi Kato and Chiaki Kamibayashi. Japan 42,701, May 30, 1922. The ground Soja bean is treated with the soln. of an alkali. Any sol. aluminium salt and coal-dust are added to the product. The mixt. is used in paving together with cement, lime, sand, etc. S. Kondo

152. Material for artificial stone. Toyoji Hatanaka. Japan 42,502, May 8, 1922. A white powder consisting of magnesia, zinc oxide, ground glass or other mineral subs., white Port. cement and clay, and a soln. of magnesium chloride, Gloiopeltis furcata (a kind of glue) and alum in water are used in making artificial stones. Magnesium chloride is sometimes excluded from the soln. S. Kondo

153. Paint for water-proofing cement. Nakajiro Mano and Ryujiro Yanaka. Japan 42,350, April 18, 1922. Fatty acid and solid paraffin are dissolved in naphtha of low m. p. S. Kondo

154. Pitch-cement. Ichita Kishi. Japan 42,291, April 12(1922). It relates to a pitch-cement which is prepd. by melting a mixt. of the pitch of petroleum, coal, brown coal or peat and magnesia. S. Kondo

155. Magnesia sheet. Sachio Miki. Japan 42,194, April 4(1922). Wires of a coarse wire-netting are cut at many points and their ends are bent up- or downwards. A paste composed of magnesia and fibrous subs. is applied on both surfaces of the netting. It is used for insulating heat. S. Kondo

156. Process of manufacturing plaster of Paris. Seikichi Fukuzawa, Ito Fukuzawa and Toyo Gips Co. Japan 43,679, Oct. 11(1922). The product of chem. reaction between sulphuric acid and lime is left in a heap until the grains get spheroidal shape. They are then washed with water to get rid of magnesium sulphate. They are again left in heap until they get spheroidal shape. They are then used in the manuf. of plaster of Paris. S. Kondo

157. Asbestos-cement. R. V. Mattison. U. S. 1,423,000, July 18. A mixt. adapted for making shingles or blocks is formed from hydraulic cement, asbestos fiber, H_2O and heavy petroleum oil. (*C. A.*)

158. Oxychloride cement. C. Catlett. U. S. 1,422,337, July 11. Solid lime and solid $CaCl_2$ are mixed in finely divided condition to form a stable oxychloride nearly free from a tendency to form lumps. Cf. *Ceram. Abs.*, **1** [4], 122(1922). (*C. A.*)

159. Molding and coloring artificial stone. B. R. Whitby. Brit. 178,736, May 10, 1921. Colored artificial stone with a glazed surface is produced by filming one side of a glass plate with cement mixt. colored as required, allowing the film to set on the glass, and then placing the latter in a mold, of which it forms a removable lining, and filling up with cement, concrete, etc. (*C. A.*)

CERAMIC ABSTRACTS

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Vol. 2 April, 1923 No. 4

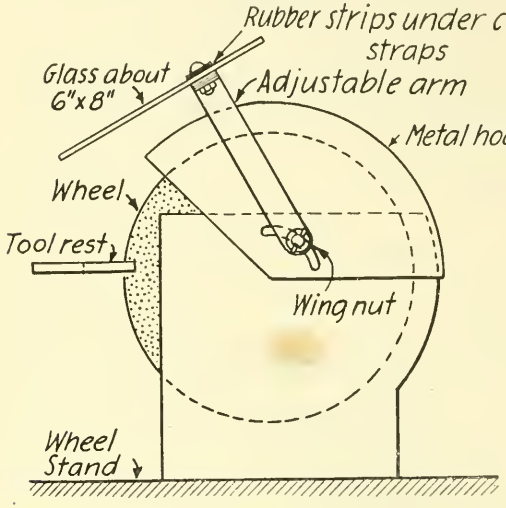
Author Index[1] to Abstracts for April

Author	Number of abstract
Anon	1, 5, 11, 52, 60, 73, 74, 89, 90
Austin, Arthur O	38
Bailey, C. F	70
Bancroft, Wilder D	79
Barbeau, Harry M	21
Berglund, Andrew	45
Bertrand, Léon	6
Bigot, A	84
Brown, G. H	37
Bryden, C. L	42
Building Code Committee	29
Cahill, W. E	55
Campbell, A. M	76
Candlot, E	4
Carruthers, R. G. and Pocock, R. W	77
Chubb, L. W	51
Colby, O. A	71
Creighton, H. J. M	86
Crowley, Joseph P	22
Devereux, P. S	35
Erckmann, Paul Emile	14
Eskola, Pentti	87
Flusin, Georges	8
Fox, C. S	9
Granger, M. A	57
Greenburg, Leonard and Smith, Geo. W	44
Griffin, M. L	85
Gross, W	40
Haney, M	2
Hess, H. W	15, 16, 18, 19, 20
Horák, M. V	10
Hückel, Walter	58
Jagger, Peter Burd	46
Jette, A. N	69
Jones, Austin F	31
Jordon, Frederick G	91
Kleeman, R. D	83
Knapp, L. H	64
Kühl, H	13
Kyle, Robert T	65
Leffler, Johan and Groenwall, Assar	54
Leicester, Charles H	32
Liljegran, E. W	50
Lillibridge, Harry D	47
Locke, Fred M	23
Martin, Jesse C., Jr	33
Martinazzoli, A	62
Mathews, J. A	59
Maus, F	49
McBride, R. S	82
McDougal, T. G	39
McIntire, C. V	67
McLaughlin, William	66
Miller, J. C. and Isles, A	68
Miller, William J	24
Ottman, F	36
Parr, S. W	43
Peiter, F	72
Pirani, M. and Lax, E	12
Planson, H	41
Pratt, John T	34
Rankin, G. A	7
Rittman, A. J	17
Ruff, Otto, Schmidt, Gerhard and Mugdan, Susanne	80
Ryon, Edward A	26
Schmidt, Johs	56
Sims, J. C	61
Slater, W. A., Hagener, Arthur and Anthes, G. P	30
Soubier, Leonard D	27
Stromboli, A	63
Stratton, S. W	88
Sullivan, William J	48
Sylvany, R	53
Trillich, Heinrich	3
Van Liempt, J. A. M	81
Von Pazsiczky, Gedeon	25
Winder, Samuel E	28
Worcester, W. G	78
Wright, W. J	75

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

1. Glass shield for emery wheel. ANON. *Queensland Gov. Min. Jour.*, **23**, 422 (1922).—The glass shield shown in the accompanying illustration has been found of considerable value in protecting operators of emery wheels. It obviates the use of goggles, with all their attendant troubles, such as broken parts, dirty lenses, and the general dislike manifested toward them. In addition, the operator cannot inhale the particles thrown up by the wheel. This is a greater menace than is ordinarily supposed, as large numbers of these particles are not visible but show their presence by pitting the shield. The glass used is a piece of plate from a broken windshield, and all the material is usually available in the ordinary shop. By mounting the glass in a hinged holder, it can easily be pushed out of the way when desired. Various adaptations can be made so that the shield will work without interfering with the usual operations in a shop. O. P. R. O.



2. Abrasives—an outline of their history. M. HANEY. *Raw Material*, **5**, 350–2 (1922). E. J. C. (*C. A.*)

Art

3. Color designation. HEINRICH TRILLICH. *Farben-Ztg.*, **27**, 3323–4, 3379–80 (1922).—Cf. *Ceram. Abs.*, **1**, 256(1922); *ibid.*, **1**, 322(1922). F. A. W. (*C. A.*)

Cement, Lime and Plaster

4. Automatic vertical furnace for the baking of cement. E. CANDLOT. *Chimie et Industrie*, **8**, 1206(1922).—The rotary furnace, now generally used, has several disadvantages namely, increased consumption of coal, use of considerable motive force, and loss of time caused by the frequency of delays for repairs. The uninterrupted working period of a rotary kiln is generally only 3 mos. and sometimes less. The vertical furnace is free from these faults to a greater extent and therefore research workers in France have been working on perfecting an automatic vertical furnace with device for loading and unloading. A history of the progress made from 1913 is given; the different makes of furnaces used and the choice of the most advantageous diam. The quality of cement obtained is of the highest. The cost of installation is much lower than that of the rotary furnace. Considerably less fuel and power is used in operation. With these advantages the new system of furnace ought to be widely adopted. It is, as yet, practically unknown on this continent, but is being very successfully operated in several large French plants. O. P. R. O.

5. Caustic magnesia cement. ANON. Bur. Standards, *Circ.* **135**(1922).—The cement resulting from the reaction of caustic magnesia with a soln. of magnesium

chloride has been known for more than half a century, and some of the products made therefrom, in the form of resilient flooring, stucco, and ship decking, have been on market for considerably more than half that period. References are given to the discovery and early history of this cement. A summary of the investigative work dealing with the process and products of setting is presented. Certain tentative test requirements and methods for conducting tests of the oxide are given. H. F. STALEY

6. Influence of the hardening of cement and lime mortars in steam under pressure on the mechanical strength of these mortars. LÉON BERTRAND. *Bull. officiel direction recherches sci. ind. inventions*, No. **36**, 608–15(Oct., 1922).—Steaming under 8 kg. (per cm.^{2}) for 3.5 hrs. doubles the strengths of neat cement and of mortars (1 of cement to 2 of sand), and gives them the same hardness as test pieces kept at ordinary temp. for a month. Too rapid cooling affects the strength adversely. The conditions of further tests on cement and hydraulic lime are described in detail and the results are tabulated and shown graphically. The strength of the pieces treated in the usual manner increased during the whole 12 weeks of the tests. In pieces treated in the autoclave, the tensile and crushing strengths both decreased fairly rapidly, reached a min. in less than 7 days, and then increased fairly rapidly, the lime regaining its initial strength and the cement exceeding it. The similarity in the behavior of the lime and of the cement tends to show that the phenomena of setting are of the same nature in both and probably related to the development of aluminates. The action of steam in the autoclave treatment causes a progressive transformation which gives rise to some unstable form of combination, which gradually changes to a stable state. As the strength of the steamed test pieces is in every case much higher than that of the unsteamed pieces, the final stable state of the former must be quite different from the final state obtained by ordinary setting in a moist atm. or under water at the ordinary temp.

A. P.-C. (*C. A.*)

7. A study of chemical reactions in the burning of lime and portland cement. G. A. RANKIN. *Concrete* (Mill section), **21**, 72–77(1922).—The paper is principally concerned with the cement kiln but some of the data are also applicable to lime burning. Three series of reactions are considered: (1) the driving off of CO_2, (2) formation of the clinker, and (3) the burning of fuel. The work involves the investigation of samples taken every 10 ft. throughout the length of a 125-ft. kiln (the ordinary chem. analysis is supplemented by microscopic examns.), and lab. expts. On the basis of this work, the work of other investigators, and theoretical considerations, R. concludes that the first two series of reactions take place economically but the third is not economical. The temp. of the flame should be increased; one way to do this is to supply O for burning the fuel rather than air. J. C. W. (*C. A.*)

Glass

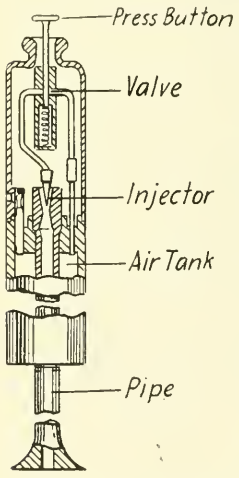
8. Silica glass, its properties, history and manufacture. GEORGES FLUSIN. *Le Verre*, **2**, 145–53, 171–7, 193–8, 217–21, 241–4, 266–73(1922).—A complete detailed review of the phys. and chem. properties of the allotropic forms of silica, with special reference to silica glass, to which is appended a bibliography of 130 references subdivided according to the headings, allotropic transformations of silica, volatilization, density, expansion, sp. heats and transformation, thermal cond., optical properties, elec. resistance, devitrification of silica glass, melting points of silica, mechanical properties, permeability to gases, chem. properties of silica glass. The history covers the various mfg. companies in England, Germany, France, Switzerland and the U. S. A. The manuf. of silica glass considers the different types of furnaces (with cuts) used, and the making of semi-opaque and transparent varieties, also the silica glasses containing ZrO_2 and TiO_2. The devitrification of silica glasses, and their uses complete the series.

Some 80 patents on silica glass are listed, together with 60 references on the silica glass industries, which seems to be complete to 1920. LOUIS NAVIAS

9. Glass manufacture—India. C. S. FOX. *Bull. of Indian Indus. & Labour*, 29(1922).—This bull. gives the early history of glass; reviews the glass industry in India and defines the properties common to the many varieties of glass. A flow sheet is given, showing a general idea of the glass manuf., beginning with the raw materials most commonly used; the treatment they receive prior to being added to the furnace as "batch;" the processes to which the plastic glass is subjected in making the various types of glass ware; and the tempering and finishing operations involved before the product is ready for market. Prepn. of the batch is discussed; glass furnaces are described, with accompanying cuts; glass and glassware, manuf. of different kinds of glass, annealing and finishing operations are discussed. The field is attractive from a business point of view, and with the establishment of several carefully located glass works not only would the Indian demand be met, but the whole eastern market would in time be supplied. O. P. R. O.

10. Unbreakable glass in Czecho-Slovakia. M. V. HORÄK. *Pottery Gazette & Glass Trade Rev.*, 48, 300(1923).—*Reutzer Trade Service* reports establishment of a firm for the exploitation of a new process for the manufacture of unbreakable and non-fusible glass discovered by a Czech engineer, M. V. Horäk. O. P. R. O.

11. Mechanical glass-blowing.—Use of compressed air. ANON. *Industrial Austral. & Min. Standard*, 48, 891(1922).—A Hamburg engineering correspondent of the *Times Trade Supp.* gives some particulars of a mechanical glass-blowing device. In the manuf. of sheet glass, he says, the blowing pipe still remains a most important tool. It consists of an iron tube about 4½ ft. long. On one end of it is gathered a mass of molten glass, and this the blower forms into a large elongated cylinder by blowing down the tube, the operation being assisted by gravity and by rotating the tube. To replace this process of blowing by the mouth, which is necessarily irregular, a method which makes use of compressed air has been devised by W. Lippold, of Dresden. The compressed air, however, is not used directly, but is employed to draw, by a jet action, a small stream of air into the pipe. A compressed air reservoir is combined with the pipe, which is, therefore, independent of any air hose, and can be turned in any direction as easily as a mouth-pipe. Regulation of the air stream can be effected very exactly by a small valve worked by a press-button, which is pressed by the chin of the blower or by a finger. If a blower makes 60 cylinders, each 4 ft. long and 1½ ft. in diameter, in 8 hrs., he has to blow in some 400 cu. ft. of air. The mechanical blowing pipe saves him this exertion, and also, it is said, considerably increases the output. O. P. R. O.



12. Some observations made on the electrolytic migration of sodium through glass. M. PIRANI AND E. LAX. *Z. tech. Physik*, 3, 232–5(1922).—The film of water which persists inside of an evacuated glass tube was removed by the migration of Na ions through the glass. A tube shaped like a lamp bulb and contg. a small W wire was evacuated and immersed in molten $NaNO_3$ at 450°. The wire was heated to a high temp. and a potential of 200 v. was applied between the wire and the molten bath. Na ions migrated through the glass and a yellow luminescence was produced in the tube. The H_2O film was displaced by this process and was attacked by the hot W as evidenced by the formation of a film of blue WO_3 on the tube. After 10–15 min. the H_2O film was

entirely removed. The method was used for making a Na glow-tube for demonstration purposes. H. B. W. (*C. A.*)

13. Problems of the German glass industry. H. Kühl. *Chem.-Ztg.*, **46**, 990–2 (1922). E. J. C. (*C. A.*)

14. Pyrex glass. Paul Emile Erckmann. *Chimie et industrie*, **8**, 785–91(1922).—A discussion of the requirements of an ideal glass, with a description of the compn. and merits of Pyrex glass and its uses. A. P.-C. (*C. A.*)

15. Operating life of tanks. H. W. Hess. *Glass Worker*, **42**, No. 5, 13(1922). J. B. P. (*C. A.*)

16. Raw material selection. H. W. Hess. *Glass Worker*, **42**, No. 7, 13; No. 8, **13**, 40(1922).—Natural products such as sand, feldspar, etc., need careful checking while trouble caused by impurities in manufd. articles such as soda ash, litharge, etc., is comparatively rare. J. B. P. (*C. A.*)

17. Glass industry fuel waste. A. J. Rittman. *Glass Worker*, **42**, No. 9, 13, 38, 40(1922).—There is still much unnecessary waste of fuel due to improper manipulation of valves and dampers in the furnaces and the use of too much steam in the producers. J. B. P. (*C. A.*)

18. The chemist in the glass factory. H. W. Hess. *Glass Worker*, **42**, No. 10, 21–2(1922). J. B. P. (*C. A.*)

19. Fire polishing glassware. H. W. Hess. *Glass Worker*, **42**, No. 11, 11, 29 (1922).—Sulfuring is remedied by changing the flame from a reducing to an oxidizing condition where it impinges upon the ware. Irregularities in pressure and quality of the gas must be avoided. Compressed air should be scrubbed as it contains dust and oil. The flame temp. of natural gas is insufficient for some purposes, it being often necessary to change to artificial coal gas of lower calorific value but higher flame temp. J. B. P. (*C. A.*)

20. Detecting stoppages in furnaces by vacuum readings. Henry W. Hess. *Glass Worker*, **42**, No. 4, 13(1922).—Under normal conditions a glass furnace should show a positive pressure of the contained gases at the edge of the crown. Half way down, the gases should show a slight pressure and at the floor level, the condition should be approx. balanced between pressure and vacuum. At the outlet of the waste gas checkers there should exist a slight vacuum, while a waste gas flue which does not leak too much should show a steady rise in vacuum to the base of the stack where it should measure from $^3/_8''$ to $^5/_8''$. J. B. P. (*C. A.*)

PATENTS

21. Glass-grinding machine. Harry M. Barbeau. U. S. 1,430,879, Oct. 3, 1922. The combination of a rotary grinding member, a member for supporting a plurality of sheets of glass edgewise, the supporting member being located to the grinding member, means for raising and lowering one of the members to adjust distance between the 2 members, and means for rotating both of the members. C. M. S., Jr.

22. Apparatus for and method of drawing sheet glass. Joseph P. Crowley. U. S. 1,428,533, Sept. 12, 1922. In an app. for continuously drawing sheet glass, a rotary device for flattening the sheet carrying surface of the device comprising a series of plane surfaces symmetrically arranged about the axis of the device, and sharp wear-resisting members at the edges formed by the interseeting plane surfaces, the edges engaging and holding the sheet, and the sheet being flattened upon the intermediate plane surface. (Cf. *Ceram. Abs.*, **1** [12] 332(1922).) C. M. S., Jr.

23. Glass. Fred M. Locke. U. S. 1,431,166, Oct. 10, 1922. A glass containing silica, boric oxide and an alkali earth, and having a coeff. of expansion not greater than .0000035. C. M. S., Jr.

24. Apparatus for manufacturing glass articles. William J. Miller. U. S. 1,428,855, Sept. 12, 1922. In a paste mold machine, a revolving support, a fixed gear axially aligned with the support, pairs of pipe rotating rollers moving with the support, gears carried by the rollers and meshing with the fixed gear to rotate the rollers, and means for resiliently pressing the rollers into engagement with the blow pipes. C. M. S., Jr.

25. Apparatus for the production of spun glass. Gedeon Von Pazsiczky. Germany. 1,427,014, Aug. 22, 1922. An improved app. for the production of spun glass having outflow orifices in its bottom plate, a vertical tube in the receptacle having inflow ports adapted to register with the inflow ports of the vertical tube so that a determined quantity of molten glass can flow from the receptacle into the inner revolvable tube, means for exerting a pressure upon the molten glass in the inner tube, and a revolving cylinder under the receptacle upon whose surface the drops of glass adhere which come off the orifices and around which the glass threads are wound which are drawn by the drops. C. M. S., Jr.

26. Glass-grinding machine. Edward A. Ryon. U. S. 1,429,106. Sept. 12, 1922. In a glass banding machine, a cutting member, a swinging support movable toward and away from the cutting member and a rotatable workholder pivotally mounted on the swinging support and thereby adjustable to vary the angle of the face of the work with respect to the face of the cutting member and yieldable means at the side of the cutting wheel for engaging and supporting the work as it is pressed against the cutting wheel. C. M. S., Jr.

27. Apparatus for and method of producing charges of molten glass. Leonard D. Soubier. U. S. 1,428,994, Sept. 12, 1922. In gob forming app., the combination of a container for molten glass having an outlet opening through which the glass issues, means to periodically sever the glass at a point adjacent the opening, means to subject the issuing glass to a reduced pressure without mechanical contact with the glass during the initial portion of each period after the glass is severed, and a regulator operating periodically within the container to exert an expelling force on the glass after it has been subjected to the reduced external pressure. C. M. S., Jr.

28. Glass manufacturing machinery. Samuel E. Winder. U. S. 1,431,436, Oct. 10, 1922. In a glass mfg. machine, glass blowing mechanism, means for transferring the blanks from the molding mechanism to the blowing mechanism, the means comprising a clamp for grasping one end of the blanks, means for enclosing the other end of the blanks, and means for elevating and lowering the clamp independently of the enclosing means. C. M. S., Jr.

Heavy Clay Products

29. Recommended minimum requirements for small dwelling construction. Building Code Committee. Bur. Standards, *Report* (1922).—Investigation by a Congressional Committee during 1919 and 1920 disclosed that existing building laws, through variations and inconsistencies of their provisions and through unduly restrictive or expensive requirements, were operating to prevent needed activity in the building industry. The Committee recommends that building codes permit 8-in. solid brick and 6-in. solid concrete walls for $2^1/_2$-and 3-story dwellings accommodating not more than two families each; that 8-in. hollow building tile, hollow concrete block, or hollow walls of brick (all rolok) shall not exceed 20 ft. in height to the gables; and that frame construction be limited to $2^1/_2$ stories. Metal lath and plaster on wood studs properly fire-stopped is approved for party and division walls, but at least every alternate wall in row houses must be 8-inch solid brick or concrete or 12-inch hollow building tile, concrete block, or hollow wall of brick. Live loads to be required as bases for design

are 40 pounds per sq. ft. for floors of wood, and 30 for those of monolithic type, or of solid or ribbed slabs. Foundation walls of brick are required to be 12 inches thick for excavated enclosures, and similar concrete walls shall be as thick as the walls they support but not less than 8 inches. Special hollow building tile 12 inches thick is permitted for foundation walls of frame buildings. H. F. STALEY

30. Test of a hollow tile and concrete floor slab reinforced in two directions. W. A. SLATER, ARTHUR HAGENER AND G. P. ANTHES. Bur. Standards, *Tech. Paper* 220, (1922).—A large slab, 48 by 115.5 ft. center to center of outer supporting girders, was loaded. In the 48 ft. dimension the slab was divided into three spans of 16 ft. each. In the 115.5 ft. dimension it was divided into six spans, two end spans were 16 ft. each, the two middle spans 19.25 ft. each, and the two spans at the other end were 22.5 ft. each. Girders extended along all panel edges, and columns stood at all intersections of girders. The slab was 6 in. thick over all and was made up of 6 by 12 by 12 in. clay tiles laid in rows parallel to the panel edges with ribs of concrete 4 in. wide and 6 in. deep between rows of tiles in both directions. Each concrete rib was reinforced with one $^1/_2$-in. round bar in the top for negative moment and with the same moment extended out into the panel one-fourth of the span length in the direction of the bar and were there hooked for anchorage. The slab reinforcement had a yield point of about 54,000 and the girder reinforcement of about 46,000 lb. per sq. in. According to current methods of design, the working loads (sum of live and dead loads) for the three sizes of panel would be 83, 67, and 48 lb. per sq. ft. for the square, intermediate-size, and long interior panels, respectively. The weight of the slab was approximately 50 lbs. per sq. ft. For about two months the square panels stood under a uniform load (sum of live and dead loads) of about 450 lbs. per sq. ft., the intermediate-size panels under 330 lb. per sq. ft., and the long panels under 280 lb. per sq. ft. The load was then shifted and (with smaller loads on adjoining panels) the loads for the succeeding 6 months on certain panels were: square panels 780, intermediate-size panels 655, and long panels 555 lb. per sq. ft. Finally the load was concentrated still more and for about 11 months the loads on single panels of each size have been: square panels 1463, intermediate-size panels 1234, and long panels 970 lb. per sq. ft. Both the deformations and the deflections increased when the load remained constant over a considerable time, but the fact that so great a load has been carried for so long a time without excessive deflection removes any misgiving as to the adequacy of the form of construction used. H. F. STALEY

PATENTS

31. Hollow tile building block. AUSTIN F. JONES. U. S. 1,432,068, Oct. 17, 1922. In a building element of the character described a hollow block grooved upon its outer face to represent a plurality of superimposed bricks with a plurality of interlocking projecting portions extending from the end of each block adjacent to its outer face the projecting portions having a relatively wide base adjacent the block and tampering in a blunt outer end the projecting portions alternating with recesses in the body of the block shaped to receive like interlocking projecting portions of a similar block when placed in adjacent relation. C. M. S., JR.

32. Interlocking brick. CHARLES H. LEICESTER. British Columbia. 1,431,530, Oct. 10, 1922. In a wall construction of the character described with the bond laid longitudinally, a plurality of layers juxtaposed blocks, key portions on the blocks forming spaces, the key portions of the blocks in one row of blocks fitting into the spaces formed by the key portions on the opposite side of the blocks in the adjoining row, and keyless blocks to form the upper and lower rows for forming openings between the upper and lower rows and the rows next adjoining the upper and lower rows.

C. M. S., JR.

33. Interlocking brick. JESSE C. MARTIN, JR. U. S. 1,431,318, Oct. 10, 1922. A brick having bosses upon a surface thereof and receptacles indented upon the opposite surface thereof, the bosses and receptacles being coaxial and being spaced equally from an end, the sides and the center line of the brick, the depth of the receptacles being greater than the height of the bosses. C. M. S., JR.

34. Tiling block. JOHN T. PRATT. U. S. 1,432,567, Oct. 17, 1922. A tile having a backing substantially rectangular in shape, the backing having one side and one end wall beveled, the backing having the outer side and end wall beveled opposite to the side and end wall first mentioned, and attaching flanges secured to and projecting beyond the backing at one side and one end thereof. C. M. S., JR.

Refractories

35. Refractories. P. S. DEVEREUX. *Jour. of Birmingham Met. Soc.*, **8**, 53–64.—A review of the whole subject of refrac. materials as follows: resistance to destructive agents; crushing strength; effects of load on various fire bricks; chromite, magnesite and dolomite refrac.; higher refrac. such as carborundum, fused alumina, zirconia, etc.; standardized testing and conservation of fuel. A paper given before members of the Society with discussion. O. P. R. O.

PATENT

36. Refractory heat-insulation. F. OTTMAN. U. S. 1,435,416, Nov. 14. A compn. suitable for building fire-resisting walls is made from kieselguhr 81 mixed with fibrous asbestos 9 and Ca phosphate (formed from lime and H_3PO_4) 10 parts. (*C. A.*)

Whitewares

37. The burning of porcelain. G. H. BROWN. *New Jersey Ceramist*, **1** [3], 204 (1921).—A discussion of the principles controlling the burning of porcelain. Failure to burn out all of the carbon from ball clay may give rise to a slight swelling of the ware and a spongy structure. It is recommended that in the firing, fuel should be introduced in relatively small charges at frequent intervals, rather than heavy charges at long intervals. The method employed in burning porcelain in Europe is discussed at length, following the information given by Dr. A. Heinecke, Director of the Royal Porcelain Factory, Berlin. The European practise is summarized as follows: (1) The ware is biscuited at a low temp. (about cone 09) reducing conditions being maintained throughout. If the chemically combined water is not completely driven out, it will retard diffusion of the reducing gases and reduction will be incomplete toward the center of the piece. Deposition of carbon may occur due to the reaction between the water vapor and hydro-carbon gases. This carbon may be removed only by prolonged heating under oxidizing conditions. From 3 to 5% carbon monoxide should be present in the kiln gases. Black smoke should be avoided. (2) Glost burning is divided into three periods, the "heating up," the reducing and the finishing periods. Deposition of tarry distillate products in the porous ware may subsequently cause blow holes, or pockets, unless this carbonaceous material is carefully removed by oxidation. (3) Oxidizing conditions are maintained during the heating up period, which extends from the beginning of the burn to the softening of cone 09. (4) Reduction extends from cone 09 to cone 8 or 9, the latter point depending somewhat upon the constitution of the body and of the glaze. The fuel gases may contain 5% hydrogen and carbon monoxide. Heating should not proceed too rapidly. Iron which has been converted into ferric oxide during the preparation of the body may be reduced to metallic iron in the body or glaze. Bodies containing iron in this form should be lightly oxidized toward

the finish. Some of the salts or alkaline earths which are present in the materials, or have been introduced in the molds may be decomposed by the reducing gases. If these gases are not allowed to escape, cavities or blebs are likely to form in the body or glaze. After the glaze has fused, the kiln atmosphere may be maintained in a neutral condition. (5) The finishing period extends from the softening point of cone 8 or 9 to the completion of the burn. Strong reduction is avoided and the atmosphere is maintained as nearly neutral as possible. An excess of 1% carbon monoxide, the exact quantity varying with the nature of the product, is not objectionable. In the burning of porcelain decorated with overglaze or underglaze containing reducible metal oxides, reduction should be followed by re-oxidation of the color oxides. It is important to know the quantity of excess oxygen present in the kiln at the beginning of the sintering of the glaze as a guide in the oxidation. An excess of 1% oxygen is ample for this purpose. C. W. PARMELEE

PATENTS

38. Joint for articles of ceramic and similar materials and method of producing same. ARTHUR O. AUSTIN. U. S. 1,431,137, Oct. 3, 1922. In combination a plurality of ceram. bodies having surfaces adjacent one another and spaced apart by interposed particles fused to the surfaces to connect the bodies to one another. C. M. S., JR.

39. Spark-plug insulation. T. G. MCDOUGAL. U. S. 1,434,133, Oct. 31. Bentonite 5% or less is used with calcines 60%, china clays 30% and a small amt. of ball clay. (*C. A.*)

Equipment and Apparatus

40. Separation of graphite by froth flotation method. W. GROSS. *Z. angew. Chem.*, **35**, 681.—The crude graphite of Sacrau, Silesia, contains on an av. 31.5% of carbon. The sepn. of this from the associated mineral by the froth flotation method has been investigated on a lab. scale, using machines in which the air to form the froth is drawn in by the rapid agitation of the mixt., and also of the type in which air is forced through a porous bottom. Wood-tar distillates were used as froth promoters. Best results were obtained with "beechwood tar oil No. 3," a heavy distillate, of which 1.49 kg. per T. of crude graphite was used, the mixt. being acidified with 1.23 kg. of sulphuric acid on the same quant. O. P. R. O.

41. Remarkable grinding mill. H. PLAUSON. *Brit. Clayworker*, **31**, 332(1923).—A mill, which can grind materials so fine that they enter into the colloidal state and so remain in suspension for an indefinitely long period, has been invented by Dr. Plauson and is now obtainable in commercial sizes. This "colloid mill" resembles the ordinary disintegrator used for very wet materials, but is driven at a much higher speed (3,000–4,000 r. p. m.). The material to be ground is mixed with 8 or 9 times its wt. of water, and is then passed through the mill, which reduces the solid particles to less than $^1/_{30,000}$ in. in diameter, and as their surface tension is greater than the effect of gravity, they remain in suspension until pptd. by chem. or other agent. This machine is capable of many uses and by its means clays of exceptional fineness can readily be prepd. The ground materials can only be sepd. from the water or other fluid in which they are suspended by passing the mixt. through a special filter. (*Tonindustrie Zeitung.*) O. P. R. O.

42. Development of the filter press. C. L. BRYDEN. *Chem. Age* (N. Y.), **30**, 493–5(1922). E. J. C. (*C. A.*)

43. Standardization of laboratory gas cocks. S. W. PARR. *J. Ind. Eng. Chem.*, **14**, 1105(1922); 3 cuts.—Various objectionable gas cocks now in general use are illustrated and discussed. A working sketch is given of a satisfactory cock to be used by the Univ. of Ill., which specifies optimum length of hose connection and size of corrugations.

The outer edges of the corrugations have slight angles instead of round surfaces, permitting easy slipping on of connection tubing but resistance to its removal.

T. F. B. (*C. A.*)

44. A new instrument for sampling aerial dust. LEONARD GREENBURG AND GEO. W. SMITH. Bur. of Mines, *Repts. of Investigations*, No. 2392, 3 pp.(1922).—In this new impinger-bubbler type of app. the dust-laden air is caused by a blower to impinge at high velocity on a wetted glass surface, and subsequently to bubble through a liquid medium. The efficiency of the app. tested against tobacco smoke and silica dust, both gravimetrically and by means of the Tyndall effect, is from 9 to 31% higher than that of the sugar tube app. It possesses the additional advantage of low control errors, owing to simplicity of manipulation. T. F. B. (*C. A.*)

PATENTS

45. Cement mill. ANDREW BERGLUND. U. S. 1,426,812, Aug. 22, 1922. A grinder for a cement mill consisting of a cylindrical body of soft material having longitudinally imbedded therein spaced and relatively thick steel bars exposed through one of the opposed ends of the body, the bars being arranged in spaced concentric circles with respect to the axis of the body of the grinder and in spaced staggered rcln. to one an other diametrically of the body. C. M. S., JR.

46. Molding and compacting plastic, fluid, powdered, granular, or the like substances. PETER BURD JAGGER. England. 1,428,097, Sept. 5, 1922. In a shaking or vibratory of a machine for molding and compacting plastic, or fluid, or powdered, granular or the like subs., a main vibratory support, means for imparting movement to the support, a platform on the support, the platform having an independent horizontal vibratory movement on the support, and means for imparting positive and controlled horizontal vibratory movement to the platform relatively to the support and while vibrating therewith. C. M. S., JR.

47. Ceramic press. HARRY D. LILLIBRIDGE. U. S. 1,430,019, Sept. 26, 1922. Pressing mechanism including a compression plunger, a feed nut and a rotative screw whereof the screw is free from endwise or traveling movement and acts by its rotative motion to impart sliding motion to the plunger, and a friction drive, coöperating with the screw for imparting rotative motion only thereto. C. M. S., JR.

48. Apparatus for transporting and unloading brick. WILLIAM J. SULLIVAN. U. S. 1,432,638, Oct. 17, 1922. Brick handling app. of the kind described, comprising a framework adapted to be suspended in balanced relation from an overhead support, a plurality of brick engaging fingers normally extending horizontally and adapted to be the lifting, supporting and carrying devices for handling a plurality of brick in stacked relation, together with means permitting an inclination of the brick engaging devices at any time to afford a gravity discharge of the brick, in combination with means acting on the devices to effect a gradual inclination. C. M. S., JR.

49. Apparatus for dehydrating solid substances. F. MAUS. U. S. 1,418,386, June 6. (*C. A.*)

50. Baffled gas scrubber and fume arrester. E. W. LILJEGRAN. U. S. 1,434,301, Oct. 31. (*C. A.*)

51. Apparatus for electrical precipitation of suspended particles from gases. L. W. CHUBB. U. S. 1,433,699, Oct. 31. (*C. A.*)

Kilns, Furnaces, Fuels, Combustion

52. Kilns. ANON. *Brit. Clayworker*, **31**, 319(1923).—"Is it possible for a given type of product to det. *a priori* the best type of kiln to adopt, giving the maximum calorific efficiency?" is the subject of enquiry by the technical commission of ceramic mfrs.

of France. Conclusions drawn from the enquiry are that accurate technical study of kilns and their working, undertaken systematically by French ceram. mfrs., would prove of vast benefit to the indus. in securing economy of fuel and improved quality of goods. It is estimated that such a study would lead to an economy of at least 3 million f. annually, this being a saving of 10% on the value of 300,000 T. of coal used by the ceram. indus. of France. O. P. R. O.

53. New type of French electric furnace. R. Sylvany. *Iron Age*, **110**, 763–4 (1922).—A new type of elec. furnace developed by T. Levoz was used in France during the war for the production of high speed steels. This furnace is a closed crucible with a single opening for charging, making addns., and pouring. The current enters through a large vertical C electrode in the roof. The horizontal section of this electrode is $^1/_2$ that of the furnace crucible. With d. c. this positive electrode is hollowed out and forms a heat reflector. The bottom electrodes are bundles of Fe wires embedded in the hearth and in the lateral linings of the furnace. The lateral lining presents a larger surface than the bottom of the furnace and permits the no. of embedded Fe wires to be increased and their cross-section decreased. Wires of 6 to 10 mm. in diam. are used. The small section metal conductors produce a more uniform distribution of elec. current and more uniform heating of slag. The lateral electrodes are arranged in two superimposed rows, the lower electrodes for fusion, the upper for refining. Current can be switched from fusion to refining electrodes or taken from both rows at once.

L. J. (*C. A.*)

54. The manufacture of electric furnace steels. Johan Leffler and Assar Groenwall. *Rev. metal.*, **19**, Abs. sec., 413–7(1922).—A brief resumé of the Swedish practice. With the introduction of the elec. furnace in 1910–11, the tonnage has been increased from 132 to 75,684 in ten years. The Groenwall Triphase is a popular design and is used extensively. Analyses of charcoal, furnace gases, slags, Lancashire and Bessemer ores and their products are given. Electrodes are 60–70 cm. in diam. and 2–3 m. long; their consumption varies from 15 to 5 kg./ton of metal, according to quality. The power consumption varies from 2000 to 2700 kw.-hr./ton, the efficiency varying from 83 to 92% and increasing with the number of furnaces operating.

W. A. M. (*C. A.*)

55. Melts gray iron electrically. W. E. Cahill. *Foundry*, **50**, 420–1(1922).—An all-scrap charge was melted and refined on a basic hearth under a reducing slag, in an 800-kw., 3-phase, 2-ton Heroult furnace. Si, Mn, and any other desired addns. are obtained from ferro-alloys. On intermittent operation, single voltage, 893 kw.-hrs. are required per ton of steel, and 784 kw.-hrs. per ton of iron. With dual voltage these figures are reduced to 851 and 709, resp. A high quality gray iron of very fine grain is obtained. S varies between 0.03 and 0.06, and P between 0.2 and 0.5%. Very little hearth repair is required; usually 10–20 lbs. of magnesite will suffice.

W. E. R. (*C. A.*)

56. Air preheating for small industrial furnaces heated with water-gas and with coal. Johs. Schmidt. *Feuerungstechnik*, **11**, 6(1922).—The most that can be saved in this way is less than 12%, which will not pay for the installation. The best means of saving heat is by preheating the charge. E. W. T. (*C. A.*)

57. Pot bank firing with petroleum residues. M. A. Granger. *Oil Eng. Finance*, **2**, 477(1922).—Expts. with a special pottery kiln designed to burn petroleum residues are described. An oxidizing atm. must be maintained and the flame must not be of too high temp. so as to cause over-burning and local fusion. The firings were satisfactory, regulation was easy and the expense equiv. to that of a wood-fired kiln.

D. F. B. (*C. A.*)

58. Comments on the paper of A. von Weinberg: "Heat of combustion and work of

dissociation." WALTER HÜCKEL. *Ber.*, **55B**, 2839–43(1922); cf. *C. A.*, **14**, 1332; **15**, 73.—H. finds at least 6 blunders, contradictions, or similar errors in v. W.'s paper. W. P. W. (*C. A.*)

59. Present status of the electric furnace. J. A. MATHEWS. *Blast Furnace & Steel Plant*, **10**, 542–4(1922). E. J. C. (*C. A.*)

60. Hawley electric furnace. ANON. *Metal Ind.*, **20**, 425(1922).—This furnace is designed for melting non-ferrous metals and alloys. Heat is generated by an arc between two horizontal electrodes and reflected on to the charge. The shell is that of a familiar type of oil-burning brass furnace and permits casting directly or through a ladle. It may be charged in horizontal or vertical position. The shape of the cauldron permits of rigid construction, interlocking lining and uniform heat absorption. An automatic oscillating mechanism is provided for mixing. Furnaces of 600, 1200 and 2500 lb. capacity are to be built but only the 1200 pound (150 kv.-amp.) size is now available. W. E. RUDER (*C. A.*)

61. Pilot-light control for furnace electrodes. C. E. SIMS. *Elec. World*, **80**, 1335(1922); Bur. Mines, *Reports of Investigations*, No. **2411**, 2(Nov., 1922).—Automatic control similar to that of the Hall Al cell is secured for a single-phase elec. furnace by employing two ordinary 40-watt W-filament lamps, set upright on a shelf near the meter board, with each lamp connected to one electrode (or busbar). The lamps have a common connection to the metal bath. The brilliancy of the filament varies with the drop in potential between the electrode and the bath. When the arcs are not the same, the difference is indicated by the lamps and if one electrode touches the bath, its pilot-light is extinguished. For 3-phase operation one more lamp is connected to the third electrode. W. H. B. (*C. A.*)

62. The Fiat electric furnace. A. MARTINAZZOLI. *Elektrotecnica*, **9**, 74–9(1922); *Science Abstracts*, **25B**, 239–41.—The Fiat is a 3-electrode, 3-phase, direct arc furnace, operated on 130 v. during the melting and on 75 v. during refining. Separate doors are provided for charging and pouring. The entire fur. rests on two curved rails which allow it to be tilted by hydraulic pistons. A bridge above the roof and supported from the fur. shell is used for adjusting and replacing electrodes and to support electrode economizers. The form of the latter is characteristic of this type of fur. The economizers are formed by a cylinder sliding inside a bell, the 1st. is fixed on the fur. roof, the 2d. on the electrode. These economizers have reduced electrode consumption to less than 3 kg. per T. of steel. The floor of the fur. is provided with a Cu plate embedded in the refrac. and connected to the center of the secondary star, thus allowing the fur. to be put into opern. with a single arc. The fur. assures making without interruption 150 hts. of 5000 kgs. each. Values for power consumption have been found in practice to be 0.6 to 0.7 kw.-hr. per kg. of steel. Cf. foll. abs. L. J. (*C. A.*)

63. Fiat electric steel furnace. A. STROMBOLI. *Chem. Met. Eng.*, **27**, 28–30 (1922); illus. L. J. (*C. A.*)

64. Status of electric furnaces. L. H. KNAPP. *Elec. World*, **80**, 605–7(1922); 9 illus.—A review. C. G. F. (*C. A.*)

PATENTS

65. Kiln. ROBERT T. KYLE. U. S. 1,426,655, Aug. 22, 1922. A kiln comprising a tunnel, a series of heat inlets opening into the tunnel at horizontally spaced points along one vertical side thereof only, and a single heat outlet from the tunnel, the outlet being located at the opposite side of the tunnel from the heat inlets and being longitudinally spaced from all of the heat inlets and in substantially the same horizontal plane therein, whereby to force the heat from the outlets to travel diagonally across the tunnel and through the ware before escaping through the outlet. C. M. S., JR.

66. Recuperator for glass furnaces and the like. WILLIAM MCLAUGHLIN. U. S. 1,432,706, Oct. 17, 1922. In a glass fur., a melting tank having gas outlet flues along its walls and terminating in a horizontal flue, a chimney into which the ends of the horizontal flue converge, air inlet passages extending through the horizontal flue and spaced from the walls of the flue and placed at the remote ends thereof, the inlet passages and outlet flues being in the same horizontal plane, and burners adjacent the inner ends of the air passages. C. M. S., JR.

67. Coal gas collecting main and ascension pipe. C. V. MCINTIRE. U. S. 1,433,634, Oct. 31. (*C. A.*)

68. Gas producer. J. C. MILLER and A. ISLES. U. S. 1,435,322, Nov. 14. A rotating device is mounted adjacent the inner wall of the producer, to grind clinker formed on or near the wall. (*C. A.*)

69. Reverberatory furnace. A. N. JETTÉ. U. S. 1,435,304, Nov. 14. A cooling coil protects a feed pipe extending through the furnace roof. (*C. A.*)

70. Kiln for firing pottery and other similar articles. C. F. BAILEY. U. S. 1,434,730, Nov. 7. (*C. A.*)

71. Electric resistance furnace. O. A. COLBY. U. S. 1,435,211, Nov. 14. Overheating of electrodes is prevented by placement of a mass of granular graphite or coke between resistors and electrodes. (*C. A.*)

72. Rotary kiln adapted for roasting boneblack or fuller's earth. F. PEITER. U. S. 1,434,023, Oct. 31. (*C. A.*)

Geology

73. Bauxite deposits in Italy. ANON. *Drug & Chem. Markets*, **12**, 223(1923).—There is every probability that a metallurgical plant will be established in Istria, Italy, where large deposits of bauxite occur. A comprehensive report on these deposits giving analyses of the ores has been made by Consul Haven of Trieste which may be secured from the Bureau of Foreign and Domestic Commerce, Washington. O. P. R. O.

74. Kieselguhr in Chile. ANON. *Jour. Royal Soc. Arts*, **71**, 141(1922).—In Tanca Province, Chile, deposits of high-grade tripoli earth have recently been discovered. A French mining engineer gave as his opinion that the tripoli earth in question was of the best quality and especially fine for glazing china. It may also be used in the manuf. of dynamite. O. P. R. O.

75. Oil shale. W. J. WRIGHT. *Canada Geol. Surv.*, Memoir, **129**(1922).—Bituminous shales in New Brunswick are being seriously investigated, the consensus of opinion of the several geologists who have examined the oil-shale deposits of Albert Mines is briefly that here is sufficient oil-shale to supply a large oil-shale industry for upwards of 100 years. O. P. R. O.

76. Feldspar. A. M. CAMPBELL. *Can. Min. Jour.*, **44**, 112(1923).—New deposit of high-potash feldspar, located near Bathurst, Ontario. Deposits are described. Analysis given: Silica, 65.10%; Ferric oxide, trace; Ferrous oxide, 0.11%; Alumina, 21.50%; Lime, 0.11%; Magnesia, 0.06%; Oxide of potassium, 12.81%; Oxide of sodium, 0.58%. Other analyses show potash, 12.61%, 11.66%, and 12.89%, respectively. Sufficient development work has been done to convince feldspar users that this deposit will supply large amounts of marketable feldspar annually. O. P. R. O.

77. Fluorspar. R. G. CARRUTHERS AND R. W. POCOCK. *Canada Geol. Surv.*, Memoir, 3d ed. (1922).—The British sources of fluorspar are by no means exhausted and not only meet home demands but furnish material for considerable export trade. This report contains notes on all the principal mines in which this mineral has been obtained in Britain, and has been brought up to date by personal inspection of the districts in which fluorspar is produced. O. P. R. O.

78. Saskatchewan clays. W. G. Worcester. *Brit. Clayworker*, **31**, 330(1923).—Prof. Worcester predicts early development of the clays of the province of Sask. O. P. R. O.

79. Problems of retarding corrosion. Wilder D. Bancroft. *Raw Material*, **5**, 267–8(1922).—If a metallic surface is corroded by the corroding medium, the attack must continue so long as the unchanged surface is exposed to the unchanged medium. A cessation of the attack under otherwise changed conditions can occur only when the metallic surface becomes coated with a film which prevents the corroding medium from coming into contact with the metallic surface. The whole problem of retarded corrosion is essentially a question of film formation. E. m. f. measurements are practically valueless. V. O. H. (*C. A.*)

Chemistry and Physics

80. Studies at high temperatures. XV. The vapor pressures of the alkali fluorides. Otto Ruff, Gerhard Schmidt and Susanne Mugdan. *Z. anorg. allgem. Chem.*, **123**, 83–8(1922); (cf. *C. A.* **16**, 190).—Vapor pressure-temp. curves for the fluorides of Cs, Rb, K, Li and Na are given between pressures of about 50 mm. Hg and 1 atm. The curves are roughly parallel, and the order of metals given above is the order of decreasing vapor pressure at any temp. For any given pressure Rb has a curve about 160° above Cs, K about 80° above Rb, Li about 180° above K, and Na about 30° higher yet. The centigrade boiling points are:

LiF	NaF	KF	RbF	CsF
1670°	1705°	1498°	1408°	1253°

Heats of vaporization, the Ramsay-Young consts., and *critical temps.* (from the Guldberg-Guy rule) are calcd. A. E. S. (*C. A.*)

81. The vapor pressure and sublimation curves for some important metals. J. A. M. van Liempt. *Z. anorg. allgem. Chem.*, **114**, 105–16(1920).—The formulas deduced in a previous paper (cf. preceding abstr.) are made use of in discussing the vapor pressures and sublimation pressures of the metals W, Pt, Mo, Cu, Sn, Pb, Zn, Ag, Bi, Cd, Sb and Au. (*Ceram. Abs.*, **1** [1], 9(1922).) J. C. S.

82. The National Bureau of Standards. R. S. McBride. *Chem. Met. Eng.*, **27**, 1159–64(1922).—The organization, functions, personnel, methods and types of work are considered. The relation of industrial research and tech. work to fundamental studies of consts. and research in pure physics is discussed. E. J. C. (*C. A.*)

83. The effect of dissolved substances on the deposition of colloidal particles from a solution by means of an electric current. R. D. Kleeman. *Phys. Rev.*, **20**, 272–9 (1922).—Porcelain slip is a colloidal suspension of particles of clay, flint, and feldspar in water (= 70%). When the solid matter is deposited in a mold by electricity a creamy layer forms. If a small amt. (0.1 to 0.3%) of Na_2SiO_3, Na_2SO_4, Na_3PO_4, Na_2HPO_4, H tartrate, Na tartrate, NaOH, or KOH is added to the suspension, a slight pptn. occurs immediately and a gradual process of pptn. (of flint and feldspar esp.) goes on. If more of the clay-flint-feldspar mixt. is added and the mixt. is agitated, the pptd. material redissolves. It requires 60% solid matter to produce the same fluidity which 30% solid matter had previously produced. Elec. deposition from this suspension will give solid deposits instead of semi-liquid ones. An increase in the amt. of the substance added to the slip increases both the fluidity of the suspension and the compactness of the deposit, but successive equal additions are decreasingly effective. Both of these effects are ascribed to a decrease in vol. of the sphere of action of the colloidal particles. This decrease in vol. is due to the influence of the small amt. of substance added to the slip. Since the second deposit is solid it is assumed that the spheres of influence of its

particles are not much larger than the particles. In the untreated slip the sphere of influence must be at least twice the size of the particles. With clay alone, the apparent sphere of action is 3 times the vol. of the particle. Colloidal particles remain in soln. if they sep. after collision, and ppt. if they do not. The forces which cause attraction or repulsion can be expressed in terms of interfacial surface tension. The distribution of particles under the action of gravity is calcd. and expressed mathematically.

F. E. B. (*C. A.*)

84. Losses on ignition and porosity of kaolins, clays, bauxites, etc. A. BIGOT. *Compt. rend.*, **174**, 1232–5(1922); cf. *Jour. Amer. Ceram. Soc.*, **5** [12], 1005(1921).—Bauxite in its natural state does not disintegrate in H_2O, but kaolin and clays do, regardless of whether in the natural state, or after grinding and compressing. The porosity of the test specimens (ground to 200 mesh, moistened and briquetted at 377 kg. sq. cm.) was detd. by the hydrostatic balance method—using a mineral oil of known d. instead of H_2O. The samples were immersed in oil for several hrs., under a bell jar from which the air had been evacuated, to avoid errors due to occluded air. The expts. indicate two new observations: (1) Clays, kaolins, and bauxites which contain more than 14% combined H_2O lose most of it around 300° and before 600°. (2) These substances, which are plastic to varying degrees, harden around 400° before normal dehydration and become agglomerated, and they do not disintegrate in cold or boiling H_2O, or in acid or alk. solns.

A. R. A. (*C. A.*)

85. The plant manager and the chemist. M. L. GRIFFIN. *J. Ind. Eng. Chem.*, **14**, 985(1922); cf. *C. A.*, **16**, 2562.

E. J. C. (*C. A.*)

86. Method of calculating fluidity, surface tension, and reaction (equilibrium) pressure. H. J. M. CREIGHTON. *J. Frank. Inst.*, **193**, 647–55(1922).—By means of an expression precisely similar to the vapor pressure equation of Ramsay and Young, it is possible to calc. the fluidity or viscosity of liquids, the equil. pressure of chem. reactions, and probably the surface tension of liquids. Agreement between calcd. and observed data indicates that the values obtained by this method represent a close approximation to the true values. "The utility of the expression $R' = R + c(T'_B - T_B)$ is evident, for if values of one of the physical consts. are known over a wide range of temps. for one substance (B), and if the value of the const. is detd. at a few temps. for a second substance (A), then its value for the latter can be calcd. over a range corresponding to the range of the known values for the first substance (B). To do this, the values of the ratio $T'_A/T'_B = R$ are plotted against the abs. temps. T'_B, and a straight line drawn through the points. By multiplying a particular temp., T'_B, by the corresponding temp. ratio (read off from the curve), the abs. temp., T'_A, is obtained at which the value of the physical const. of the substance A is equal to that of the substance B at the abs. temp. T'_B. If the line does not run through the points (*i. e.*, if c is not const.), it is probable that the exptl. data are not accurate, or that one of the substances behaves abnormally.

J. S. H. (*C. A.*)

87. Silicates of strontium and barium. PENTTI ESKOLA. *Am. J. Sci.*, **4**, 331–75 (1922).—Considering the wide occurrence of isomorphous sulfates and carbonates of Ca, Sr and Ba, the question rises: Do Sr and Ba under exptl. conditions form such silicates as are known in the case of Ca? For this study the purest SiO_2, Ca, Sr and Ba carbonates obtainable were used. These substances were dried at 150°, weighed, mixed, melted if possible, chilled and crushed, then reheated and ground twice more. The equil. relations were ascertained by the quenching method. Heating curves were run in some cases for the purpose of checking the temp. measurements. Temps. were detd. by a potentiometer and a thermoelement calibrated against the m. p. of diopside and anorthite. Refractive indices were detd. by the improved immersion method of Merwin. The systems $SrO.SiO_2$, $BaO.SiO_2$, $CaO.SiO_2$–$SrO.SiO_2$ and $CaO.SiO_2$–BaO.-

SiO_2 were worked out and the results collected in 12 tables and 12 charts of curves. Crystallographic features are shown in 5 illustrations. Sr and Ba feldspars were found to be analogous to anorthite. L. W. R. (*C. A.*)

General

88. Annual report of the director of the Bureau of Standards, 1922. S. W. Stratton.—The outstanding feature of the fiscal year ended June 30, 1922, as far as the Bureau of Standards of the Department of Commerce is concerned, was the great amount of attention paid to industrial standardization, to the elimination of waste in the industries, and to the simplification of industrial products. New and important work undertaken during the year was that in connection with building and housing. H. F. Staley

89. Porcelain bells in Germany. *Zeit. für Instrumentenbau*, January(1923).—The State Porcelain Manufactory at Meissen has succeeded, after repeated experiments, in mfg. a set of chimes of fifty bells, of which the tallest is some 5 ft.; the chime is intended for the use of the Town Church. The tone of the bells, which are tuned after firing, is stated to be remarkably soft and mellow. O. P. R. O.

90. New vacuum drying plant. Anon. *Chem. Trade J.*, **71**, 451–2(1922).—A description of a new type of vacuum drier installed at the works of the *Soc. matieres colorantes et prods. chim St. Denis.* It consists of an air-tight drying chamber contg. trays, a barometric condenser, a Delas steam jet air extractor for maintaining a vacuum in the condenser and drying chamber. This jet discharges into the steam space of the drier and thereby furnishes the heat for drying. The nozzle is simpler and requires less attention and repairs than a vacuum pump. In every case the actual economy is above 50%. L. A. P. (*C. A.*)

PATENTS

91. Damproofing concrete body. Frederick G. Jordon. U. S. 1,429,740, Sept. 19, 1922. A damp-proof concrete body, comprising a plurality of perforated sheets embedded in such body, with a bonding strata of cementitious material therebetween, the sheet having alternate openings of the strata, and solid portions of greater area than the openings, the sheets having such relative arrangement as to locate the openings of one sheet centrally opposite the solid portions of the adjacent sheet. C. M. S., Jr.

BOOK REVIEWS

Chelsea Porcelain. William King. Published by Charles Scribner's Sons. New York. 1922. $20.

With the present pedagogical and industrial interest in ceramic art development comes specialized and general literature according to past achievements, present activities and future possibilities. The latter invariably closely follows the former.

While the potter himself (meaning the manufacturer, plant official and active worker) has not to date followed closely enough the ceramic literature of his day, there have always been enough interested outsiders or "laymen" to tempt the publisher to speculate on occasional ventures in the ceramic field.

Were it not for this fact, the printed information available to the ceramic student would be meager indeed. Then again, the potter himself is not particularly conspicuous as an author; except for the works of Solon, Burton, Binns and a very few others, the potter has been strangely silent. He is perhaps too much occupied and absorbed in his own field, or he is or has been more or less inarticulate and uncommunicative.

If the present day scientific and technical organizations had existed in the various countries during their highest periods of ceramic development, we would

no doubt have some wonderful practical records in addition to the existing historical data.

Data, however, is so conglomerate, general, and often so unreliable and unauthentic that the selection of a reliable work on a practical subject is an extremely uncertain proposition.

This may be good reason why the potter as a rule is not a heavy purchaser of ceramic literature. The conjectural musings of the ceramic historian are not only unconvincing, they are often ridiculous from a practical point of view. And the clay worker is essentially a practical individual with little patience for romantic theories, no matter how enthusiastic the author might be.

Plate painted in the style of Kakiemon. (Collection of Dr. and Mrs. Bellamy Gardner.)

However, when an authoritative and comprehensive work does appear, it is worth the attention of any ceramist interested in the subject. "Chelsea Porcelain" by William King of the Victoria & Albert Museum is such a work. It adequately but concisely covers the field previous to the founding of the Chelsea Factory about 1745, and then outlines the subsequent developments so far as they are known.

While Mr. King is authority enough for the conclusions arrived at, every source of information is included. To one not familiar with the history of the activity (so far as this is known), this consistent inclusion of references is likely to make the work rather difficult to read. But this should not detract from the interest or value of the book.

The close descriptive detail of the various examples and the consistently pieced together historical evidence represents an enormous amount of patience and interested labor, which will perhaps be appreciated more by the collector and historical student than by the practical potter.

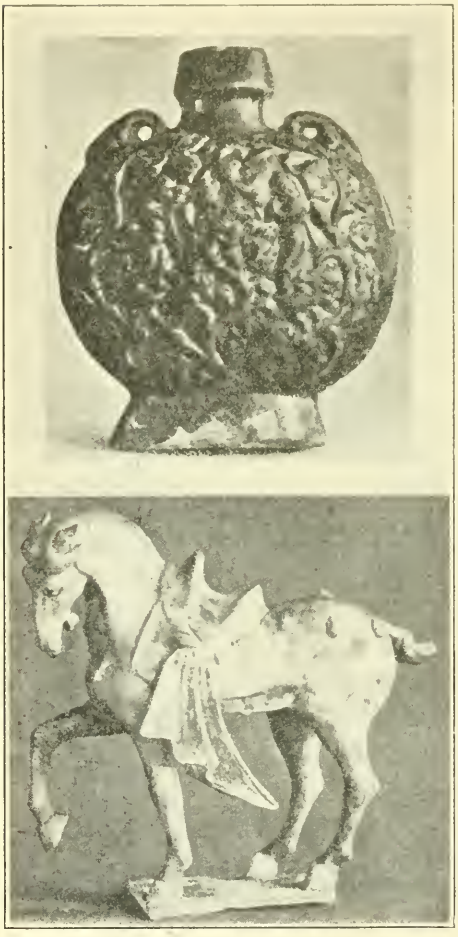


Fig. 1.—Pilgrim bottle of grey stoneware with olive-brown glaze, decorated in high relief showing Hellenistic influence, T'ang Dynasty (in the Victoria and Albert Museum).

Fig. 2.—Caparisoned horse pawing the ground, hollow body made of buff pottery, yellow glaze, T'ang Dynasty (in the Benson Collection).

The chief value of this book to the manufacturer and the ceramic decorator lies in the illustrations which are large and clearly enough reproduced to give an excellent idea of the texture and technique of the example shown. There are one hundred and seventy odd illustrations (a few in color) of clocks, candlesticks, plates, teapots, cups, pitchers, trays, dishes, perfume bottles, figurines and all the various bric-à-brac popular about the time of George III.

The book is an amazingly fine record of an activity about which too little is known. It should be a welcome addition to the factory library where it will be a valuable reference and inspiration to the potter and decorator.

Frederick H. Rhead

The Early Ceramic Wares of China. A. L. Hetherington. Published by Charles Scribner's Sons. New York. 1922. $20.00.

A companion volume to "Chelsea Porcelain" by William King. An able historical account of the pre-Ming wares in which is included an unusually interesting and authoritative description of the technique of the Sung and Yuan wares. (Chapter IX.)

The notes on copper reds will be read with keen appreciation by the practical potter interested in such types.

As the author states in his preface, the illustrations are for the most part selected from good specimens in private collections. This is a good plan because the average student may readily see museum specimens while the private collection is not often available.

The potter will find much more technical and practical information in this book than is found in most historical accounts of ceramic development. The book is a fit companion to "Chelsea Porcelain" and an essential to the library of the up-to-date potter and manufacturer.

Frederick H. Rhead

Grundzüge der Keramik. By Dr. W. Pukall. Verlag von Müller & Schmidt, Coburg. 1922. 187 pp.

Grundzüge der Keramik is a text-book on ceramic subject matter. The treatment is of a general nature and given from a practical viewpoint; but considered in the light of chemical relations.

In an introductory section, a classification of clay products is outlined, of which the main divisions are: (1) earthenware, (2) stoneware, (3) whiteware, and (4) porcelain. Following a general section treating of raw ceramic materials, and of common tests for these, the text takes up the subject matter under the four divisions named above.

The raw materials are considered as (1) plastics, (2) non-plastics, and (3) auxiliaries, such as gypsum, coal, etc. The tests are classified as (1) preliminary and (2) special, or exact. Interpretation of results of examination of elutriation residue are given, and conclusions drawn from results of burning raw test pieces to various temperatures. The method of calculation from weight to volume basis is shown. For further calculations, reference is made to the book on Ceramic Calculations written by the author.

In discussion of earthenware products, types of glazed and unglazed wares are considered, also glazes, methods of glazing and decorating, and the process of burning. Similar treatment of stoneware products is given, but including a discussion of crystalline and decorated crazed glazes. Whiteware products are treated more at length, and problems of preparation and burning are fully treated. Porcelains are discussed as to types, constituent raw materials, preparation, glazing, and decoration. Basic glaze formulae are given, and also effects and strength of colorants. Formulae for different colored glazes and enamels, and for rare metal colors and lusters are given.

E. E. Pressler

COMPILATION OF DATA, BIBLIOGRAPHIES AND ABSTRACTS

The SOCIETY is engaged in the compilation of data and bibliographies which are of direct value to ceramic manufacturers and technologists. Abstracts of the world's literature on given subjects are being assembled which will serve as reviews of all the knowledge extant on those subjects. New methods, processes and materials are being investigated.

This is the comprehensive service which the AMERICAN CERAMIC SOCIETY is rendering the ceramic industries.

Through the committees of the Industrial Divisions the work of the SOCIETY is made practical and timely. The problems and needs of each industry are known because the officers and committeemen of the Divisions are, for the most part, in the factories.

With the several Divisions collaborating through the central committees each using the same media for exchange of knowledge, the SOCIETY brings to the solution of the several problems which are common to more than one industry, all the knowledge that applies. In this lies the value of all the ceramic industries joining in the support of this, the only organization devoted exclusively to the promotion of the technical, scientific and artistic interests of the ceramic industries.

The "Collective Index" of papers on Vitreous Enamels, compiled and edited by R. R. Danielson and T. D. Hartshorn of the Enamel Division may be had free upon application to the Secretary's Office.

The "Collective Index" to the first nineteen volumes of the *Transactions of the American Ceramic Society* is also available. Price $1.50.

CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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Vol. 2 May, 1923 No. 5

Author Index[1] to Abstracts for May

Author	Number of abstract
Ackerman, A. S. E.	109
Adams, I. E.	37, 41
Allison, L. W.	140
Amsler, W. O.	45
Anon.	3, 4, 5, 6, 7, 8, 9, 10, 13, 17, 18, 24, 48, 49, 50, 51, 55, 56, 57, 59, 60, 62, 64, 75, 81, 83, 86, 87, 88, 91, 92, 93, 106, 111, 133, 134, 135, 136, 137, 138, 139, 141, 142, 143, 144, 145, 146, 160
Antonoff, G. N.	115
Asahara, G.	63
Atkinson, J. S.	149
Baillie, W. L.	20
Benedicks, C. and Sörberg, E.	2
Bied.	12
Boswell, P. G. H.	71
Boudouard, O. and Lefranc, J.	107
Brenner, R. F.	31
Brumbaugh, J. D.	103
Burchartz, H.	58
Buttolph, L. J.	127
Capp, J. A.	79
Carter, A. S.	23
Charriou	105
Chatley, H.	104
Chéine, S. D.	1
Cole, G. A. J.	100
Cousen, A. and Turner, W. E. S.	29
Cox, S. F.	46
Cressy, E.	158
Currie, J.	27
Davidson, F.	80
Davis, A. C.	14
Demorest, D. J.	150
Desch, C. H.	126
Desgraz, A.	11
Discussion	26
Drever, H.	148
Durbin, P. C.	69
Eckel, E. C.	16
Edmonds, W. G.	33, 36
Ells, S. C.	89
Elworthy, R. T.	90
Fabre, J. H.	159
Fahrenwald, A. W.	117
Farmer, F. M.	76
Fleury, P.	122
Flood, L. W.	61
Ford, W. E.	101
Frydlender, J. H.	151
Gardner, J. H.	44
Goucher, F. S. and Ward, H.	125
Grocholl, K.	67
Grout, F. F.	95
Harkins, W. D. and Feldman, A.	121
Harris, J. E. and Schumacher, E. E.	42
Hart, E.	131
Heuer, R. P.	65
Holmes, W. H.	32
Huntley, F. S.	35
J. L.	119
Jackson, F. G. and Shaw, L. I.	113
Johannsen, A.	98
Kallauner, O. and Hruda, J.	110
Kenney, A. W.	78
Krak, J. B.	39
Kraus, C. A. and Darby, E. H.	47
Kreisinger, H. and Blizard, J.	152
Levy, L.	155
Liddell, D. M.	130
Lidstone, F. M.	116
Lohman, C. J., Jr.	112
Lovejoy, E.	53
Lowry, T. M.	108
Manchot, W.	123
Manly, J. J.	153
Marshall, A. E.	43
Mayers, W. S.	38, 40
Norris, W. F.	28
Pile, S. and Johnston, R.	128
Petts, E.	52
Rees, W. J.	30
Rideal, E. K.	120
Ries, H. and Bayley, W. S.	97
Rimbach, R.	147
Rishkevich, E.	68
Rohn, W.	74
Roth, E.	73
Sauvageon, V. M.	34
Scott, A.	118
Smalley, E. L.	84
Smith, W.	70
Sortwell, H. H.	72
Strickland, D. M.	156

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Author Index to Abstracts for May (*Continued*)

Author	Number of abstract
Thompson, J. G.	114
Turner, W. E. S.	19, 25
Turner, W. E. S. and Hodkins, F. W.	22
Van Dusen, M. S.	124
Vogt, J. H. L.	94
Waeser, B.	154
Wallace, A. M.	132
Washington, H. S.	96, 129
Watson, J.	15
Weed, J. M.	66
Wescott, H. P. and Diehl, J. C.	82
Wilson, G. V.	85
Winchell, N. H. and A. N.	99
Withey, W. H.	21
Wollaston, T. R.	157
Woodson, J. C.	77
Wyer, S. S.	102
Zakharoff, A. A.	54

Abrasives

1. The manufacture of aluminium in Russia. S. D. Chéine. *Communications travaux tech. sci. effectués Republique Russe*, **5**, 71–3(1921); *Rev. métal.*, **19**, 568–9 (Abs.) (1922).—B. J. Zbarsky has worked out a method for the com. sepn. of Fe salts from a soln. of $Al_2(SO_4)_3$, which allows of working kaolins by the so-called acid process for the production of Al. Kouznietsoff and E. J. Joukovsky treat a mixt. of Al ore, baryta (or $BaCO_3$) and Fe scrap in an elec. furnace, obtaining products such as ferro-Si and Ba aluminate (the latter in the form of a slag). The Ba aluminate is dissolved in water, and the Al is prepd. by one of the usual methods and the recovered Ba is re-used. This process is suitable for the Tikhvine bauxites, which contain large amts. of SiO_2 and of Fe and which could supply the whole Russian requirements of ferro-Si. A. P.-C. (*C. A.*)

2. Improvement of emery papers. Carl Benedicks and Erik Sörberg. *Z. Metallkunde*, **14**, 397–9(1922).—Ordinary fine-sized emery paper is fastened to a coarse book-binding paper under pressure so as to provide furrows which will care for the sepd. emery particles and prevent excessive scratching. Photomicrographs show steel samples polished with ordinary and improved paper. W. A. M. (*C. A.*)

Cement Lime and Plaster

3. Tentative methods of testing gypsum and gypsum products. Anon. *A. S. T. M. Tent. Stand.*, 307, **1922.**—Detailed chem. methods are given for the detn. of free and combined H_2O, CO_2, SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO, SO_3, NaCl. Physical tests include detn. of fineness, consistency, H_2O carrying capacity, dry bulk, wet bulk, time of setting, tensile and compressive strength, and sand carrying capacity. E. N. Bunting

4. Tentative definitions of terms relating to the gypsum industry. Anon. *A. S. T. M. Tent. Stand.*, 320, **1922.**—The following are defined: accelerator, aggregate, binder, cement, consistency, lath, mortar, plaster, plasticity, retarder, stucco, and wood fiber. E. N. B.

5. Tentative methods of making compression tests of concrete. Anon. *A. S. T. M. Tent. Stand.*, 299, **1922.**—Detailed instructions are given for this test. E. N. B.

6. Tentative specifications for gypsum. Anon. *A. S. T. M. Tent. Stand.*, 268, **1922.**—Includes: I. Materials and Standards. II. Sampling. III. Packing and Marking. IV. Inspection. E. N. B.

7. Tentative specifications and tests for compressive strength of Portland cement mortars. Anon. *A. S. T. M. Tent. Stand.*, 229, **1922.**—Compress. strength in lbs. per sq. in. should = 1200 after 7 and 2000 after 28 days. Test piece should be in form of cylinder 2″ diam. x 4″ length molded from non-corroding molds. Any calibrated testing machine may be used. Samples differing $> 15\%$ from av. should not be considered in detg. compress. strength. E. N. B.

8. Tentative specifications for concrete aggregate. Anon. *A. S. T. M. Tent. Stand.*, 259, **1922.**—Sieve tests, strength tests and color test are covered. E. N. B.

9. **Tentative specifications for quicklime and hydrated lime for the manufacture of silica brick.** ANON. *A. S. T. M. Tent. Stand.*, 257, 1922.—Chem. compn. requirements and sampling methods are given. Min. CaO content is 92% and max. MgO 3%. E. N. B.

10. **Tentative methods of chemical analysis of limestone, quicklime and hydrated lime.** ANON. *A. S. T. M. Tent. Stand.*, 277, 1922.—Details are given for estimation of SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO, SrO, volatile matter, H_2O, CO_2, SO_2, total S, phosphorus, manganese, available lime. E. N. B.

11. **Characteristics for the evaluation of limestone, dolomite and similar carbonate rocks and a rapid method for analyzing the same.** A. DESGRAZ. *Z. angew. Chem.*, **35**, 714–5(1922).—The attempt is often made to judge a limestone by measuring the vol. of CO_2 evolved on treatment with an acid or by the loss on ignition but these tests often lead to erroneous conclusions. Sometimes an impure $MgCO_3$ will give the same CO_2 content as a pure $CaCO_3$ and often substances are present which lose water on ignition. The loss on ignition together with the behavior on slaking gives a better characterization. A pure calcite will give 41–44% loss on ignition, will slake rapidly and give a white oxide. A dolomite will give higher loss on ignition and a more grayish oxide which will not slake as readily. Calcite contaminated with much Fe and Al will show a lower loss on ignition and a yellowish oxide. The following very rapid method of analysis gives excellent values for CaO and MgO. Dry the sample at 110° and heat 1 g. to const. wt. at 930–950° to get the loss on ignition. Slake the residue with a few drops of water and transfer to a 150-cc. beaker. Boil with 30 cc. of a concd. soln. of NH_4Cl until no more NH_3 is evolved; this shows that all of the Ca and Mg has dissolved as chloride. Filter into a 500-cc. calibrated flask, ignite and weigh the residue of Al_2O_3, Fe_2O_3, Mn_3O_4 and SiO_2. In 100 cc. of the soln. det. the Ca by pptn. with $(NH_4)_2C_2O_4$ in the usual way. In another 100 cc. of the chloride soln. det. Mg without removing Ca by adding 10 cc. of 10% citric acid soln., 50 cc. of concd. NH_4OH and 30 cc. of 0.5% $(NH_4)_2HPO_4$ at 80°. Cool with running water, filter, wash with 2.5% NH_3 soln., ignite and weigh as $Mg_2P_2O_7$. W. T. H. (*C. A.*)

12. **Aluminous cement.** BIED. *Rev. univ. mines*, July, 1922; *Technique moderne*, **14**, 508–9(1922).—Aluminous cements are cements with a high Al_2O_3 content, known commercially as "fused," "elec.," or "electro-fused" cement, in which the Al_2O_3 content is equal to or greater than the SiO_2 content. They are produced by fusion because Ca aluminates do not soften and clinkering is very difficult. Methods of manuf. are described. The compn. is about: SiO_2 10–12, Al_2O_3 40–45, CaO 35–40, FeO 15–20%. Setting starts in about 4 hrs., and is complete in 7–8 hrs. Hardening is very rapid and an ordinary concrete (800 l. gravel, 400 l. sand, 350 kg. cement) has a min. strength of 300 kg. per cm.^{2} in 72 hrs., which is much higher than the strength of Portland cements after 90 days. Also in *Rev. metal.*, **19**, 759–64(1922). A. P.-C. (*C. A.*)

13. **Caustic magnesia cement.** ANON. Bur. of Standards, *Circ.* **135**, 1–14 (1922).—General information concerning this type of cement is given, including discovery, early history, methods of manuf., and use for flooring, stucco, and ship decking. Considerable confusion has arisen because of the variety of names under which the material has been sold and variations in its quality and behavior. Recently a committee representing a Western organization of producers and two of the Federal bureaus has been organized to write specifications. Color, fineness, time of set, modulus of rupture, and constancy of vol. are being considered. Chem. requirements have been omitted. J. C. W. (*C. A.*)

BOOKS

14. **Manufacture of Portland Cement.** ARTHUR C. DAVIS. 3rd Ed. Revised and enlarged. Dublin: J. Falconer. 429 pp. 25s. (*C. A.*)

15. Cements and Artificial Stone. J. WATSON. Edited by R. H. RASTALL. Cambridge: W. Heffer & Sons, Ltd. 131 pp. 6s. (*C. A.*)

16. Cements, Limes and Plasters. EDWIN C. ECKEL. 2nd Ed. Revised and enlarged. New York: John Wiley & Sons. $6.50. Reviewed in *Eng. Mining J.-Press.*, **114**, 1126(1922). (*C. A.*)

Glass

17. Glass-making sand. (New Zealand.) ANON. *Raw Mat. Rev.*, **2**, 93(1923).—Deposits have recently been discovered by accident at Mount Somers, Canterbury. Prospecting had been in progress for about 12 mos., with a view to locating coal seams within easy access of the Gov't railways. After a 7-ft. drive had been made to a length of 400 ft., it was proved beyond doubt that an immense body of silica was present. Analysis shows that the sand is almost pure silica, containing no less than 99 per cent, a percentage never recorded before in any part of the world. Experts from glass-mfg. concerns have also examnd. the sand, and declare it to be the finest they have secn. O. P. R. O.

18. Pyrex glass. ANON. *Chem. Zeit.*, May 25, 1922.—Pyrex glass is remarkably resistant to changes of temp., and may be used over an open fire. Expts. show that ordinary heating is not sufficient to melt the materials for such a glass, and a special furnace, possibly with surface combustion is required. Chem. compn. of Pyrex: Silica, 80.71; boric anhydride (B_2O_3), 10.47; alumina, 3.55; lime, 0.70; magnesia, 0.57; soda (Na_2O), 4.14. The low alkali content is noteworthy. O. P. R. O.

19. Glass and metal. W. E. S. TURNER. *Metal Ind.* (London), **22**, 128(1923).—Glass manuf. processes were contrasted with those in steel manuf. in a lecture given by Mr. Turner to the Sheffield Association of Metallurgists and Metallurgical Chemists, "Some Problems Common to the Study of Glass and Metals." Furnaces are similar, except that in the glass furnace the great desideratum is an oxidizing atm., while in the metal furnace it is a reducing atm. The conditions of working out are different in that the plastic glass can be worked direct into the article required and is not cast in ingot form, except in optical glass, and even then the glass is not teemed. The study of glass might assist in a number of interesting problems connected with hardening of metals. The cryst. forms of silicates have a distinctly different sp. ht., d., hardness and other properties from vitreous, and Mr. Turner suggested points of value in this connection. He further contrasted corrosion of glass and metals, and pointed out that a surface like glass appeared not to be homogeneous when subjected to chem. agents. O. P. R. O.

20. Use of the autoclave method in testing glassware. W. L. BAILLIE. *Glass Worker*, **42** [17], 13(1923). (From *Pottery Gazette and Trade Rev.*)—The autoclave test is reliable and expeditious, and its acceptance as a standard is urged. Three tests of increasing severity are 2 hours at 30 lbs., per sq. in., 3 hours at 50 lbs., 3 hours at 90 lbs. Should be made on finished piece and not on ground glass. The criteria of durability are alkalinity, clouding or superficial disintegration and the amount of residue on evaporation. R. J. MONTGOMERY

21. Some criticism of the use of the autoclave as a method of testing glassware. W. H. WITHEY. *Glass Worker*, **42** [17], 13(1923) (From *Pottery Gazette* and *Glass Trade Rev.*)—Tests on a zinc and a lime borosilicate glass showed inaccurate results, because the lime glass developed a protective coat on its surface which retarded action. The zinc glass did not do this. R. J. M.

22. Some difficulties of the interpretation of autoclave results. W. E. S. TURNER AND F. W. HODKINS. *Glass Worker*, **42** [17], 13(1923). (From *Pottery Gazette and Glass Trade Rev.*)—Results of test made at over 60 lbs. pressure are hard to interpret. As a

test for optical glass, the autoclave was insufficient as results were misleading. The boiling water test on crushed glass is as good and much more simple. R. J. M.

23. Chemical deposition of silver on mirrors. ALBERT S. CARTER. *Glass Worker*, **42** [18], 13(1923). (From the *Carnegie Technical, Jr.*)—Electroplating is satisfactory for metallic mirrors but not for glass. Chloride electrolyte is 3780 grs. H_2O, 85 grs. AgCl, 226 grs. NaOH or KOH, potential $^1/_2$ volt. Nitrate electrolyte, 100 grs. H_2O, 3 grs. $AgNO_3$, 3 grs. HNO_3, 3 grs. $C_4H_4O_6H_2$, 2 grs. $Fe(NO_3)_3$, potential 1 to $1^1/_2$ volts. Careful cleaning of the surface is necessary. A variation of the Edel process and the Brashear process are given for chemical deposition of silver. Various solutions and methods are given. R. J. M.

24. Decorated glass beads. ANON. *Schnurpfeil's Rev. for Glass Works.*, **6** [69], 1407 and **7** [70], 1439.—Descriptive article on bead making in Bohemia. Method of making and decorating is given for Coupé, Rocaillis, Macca and Thuringan types. R. J. M.

25. British glass industry; its development and outlook. W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 108–46(1922).—Presidential address, containing an acct. of the history of the industry with statistics as to number of factories, workmen, production, exports, imports, etc. The British industry was an off-shoot of the continental and amounted to little until fostered by monopolies granted by Queen Elizabeth. In spite of oppressive taxation and regulation up to 1845, the century after 1775 was a prosperous one for the industry which reached the culminating point in 1874. Then until 1914 it struggled along under the handicaps of foreign protective legislation and foreign competition. The War, of course, forced the production of optical, chemical, and other glassware, previously almost entirely imported, and left the industry much better equipped than before. To England belongs the credit for first substituting coal for wood, for introducing covered pots, annealing in leers, open and shut molds, for discovering lead glass, and for developing the first bottle machine. Recently the industry has been revolutionized by the introduction of semi-automatic and automatic machines, largely American, and by the substitution of scientific for rule of thumb methods. Trained chemists and engineers are now being employed, research institutes have been established and a scientific Society with nearly 700 members has grown up. It is pointed out that future prosperity depends on stimulating the home market, extending the use of glass for containers, cooking, etc. The address closes with an eloquent description of the industry as a growing lad, dependent on its own energy and enterprise, lacking experience and confidence, needing criticism and help, but with no small latent power. G. F. FULCHER

26. Problems in the melting of glass II. (Discussion.) *J. Soc. Glass Tech.*, **6**, 147–56(1922).—(1) *Best ratio of cullet to batch.* When batch alone is used, the glass takes longer to plain and is also somewhat softer. It may contain very fine seed which affects its working properties. The cullet contains more iron and more alumina than the batch, therefore makes the glass more colored and more viscous, but it helps in plaining. Practice varies widely, depending largely on the amount of cullet available. In the case of tank furnaces, the important thing is to keep the ratio constant so that the properties of the glass will not change. (2) *Salt-cake vs. soda-ash in soda-lime glass batches.* Although no scientific explanation is at present available, it is a matter of experience that glass made from batch containing salt-cake is easier to work, and apparently has a longer viscosity range than if soda-ash alone is used. It was suggested that this is due to greater homogeneity. It is American practice in making window glass to use 1 part salt-cake to 2 parts soda-ash. However, the salt-cake is more corrosive of the refractories and sometimes gives a bluish green color. (3) *Advantages of thoroughly mixing batch and cullet* were pointed out, to insure homogeneity of the glass. (4) *Equipment needed for control of window glass tank* is listed. G. F. FULCHER

27. Columnar structure in sandstone tank blocks after rapid heating and cooling. John Currie. *J. Soc. Glass Tech.*, 6, 156–60(1922).—Blocks forming the lower course of the walls of a green bottle glass tank, became rapidly heated from about 800° to 1300° during the draining of the tank and were then rapidly cooled. They were found to show a columnar structure normal to the cooling planes, similar to that of basaltic columns. Four photographs are reproduced. G. F. Fulcher

28. Medieval glass of York Minster. W. Foxley Norris. *J. Soc. Glass Tech.*, 6, 160–7(1922).—York Minster contains 109 windows with over 25,000 square feet of English glass of the 13th, 14th and 15th centuries. During the War, 23 windows were removed for preservation against destruction by raids, and it was then found that the windows were in a dangerous condition because of the disintegration of the lead, and also that the glass seemed to be diseased, many pieces being badly pitted and some having scaled off until they were paper thin; others had crumpled to dust. The windows were being gradually cleaned and releaded, the mellowing effect of centuries of dirt being removed but the original brilliancy being restored. W. E. S. Turner explained the disease as due to a *gradual hydration of the glass*, which was doubtless a lime glass made from French sand with perhaps not much alumina. G. F. Fulcher

29. Production of colorless glass in tank furnaces, with particular reference to the use of selenium. Part I. A. Cousen and W. E. S. Turner. *J. Soc. Glass Tech.*, 6, 168–81(1922).—A large number of small scale melts of a simple soda-lime-glass made with soda-ash showed that if the iron content is .09% or less, a colorless glass may be produced by adding .003% of selenium together with .0005% cobalt oxide. However, with even a small amount of salt-cake in the batch an increased amount of selenium was required. The salt-cake seems to react with selenium at high temperatures, producing sodium selenite, and it also tends to increase the iron content by corrosive action on the pot or tank walls. With batches containing soda-ash only, sodium selenite is about ten times more effective in decolorizing action than elementary selenium but this is not true of batches containing salt-cake. Reheating, and presumably annealing, decolorized glass does not introduce color, but over-decolorized glasses may have the amber tint deepened by heating at 525–575°. Further experiments are proceeding to determine more definitely the relative value of selenium and of sodium selenite as decolorizers and also the influence of reducing agents, including white arsenic.

30. Critical review of the provisional specifications for glass refractory materials. W. J. Rees. *J. Soc. Glass Tech.*, 6, 181–204(1922).—(1) *Silica brick.* For bricks to be used in such positions as furnace pillars, it might be well to specify a powder density of 2.35 so as to insure at least 80% conversion into tridymite; but for bricks to be used in crowns such a stipulation may not be necessary or desirable. A specification as to mechanical strength would be desirable. It was pointed out that exposure to a moist atmosphere diminishes the mechanical strength markedly. Special specifications for bricks to be used in regenerator chambers are also needed. (2) *Tank blocks.* There is great need for more information as to the causes of block failure, whether due to the particular melting conditions or to the materials or manufacture of the block. In some tanks the corrosion is not greatest at the metal line but may be worse on the lower blocks, due probably to mechanical corrosion. Tanks should always be raised to a high temperature before the filling is begun. The two most important factors governing the life of a block are porosity and uniformity of texture. Results of tests of 8 makes showed that the two blocks with porosity of only 21 and 19% and with after-contraction of only 1.4 and 0.8% gave the best service, one lasting 18 months in a tank furnace melting a salt-cake batch. The grog should be of the same clay or at least have the same solubility as the rest of the block. Perhaps unweathered clay would be better than weathered clay. Methods of test are discussed. A small special tank seems best. The practical

difficulties of producing uniform blocks are very great. Coöperation between block makers and users is necessary for best progress. In the discussion, it was suggested that since small blocks are more easily made uniform than larger ones, they should be tried. (3) *Pot clays.* The specifications are decidedly debatable. Though there is a tendency to use aluminous clays, siliceous clays give greater strength and show less shrinkage. G. S. F.

31. Manufacture and properties of oven glass. R. F. Brenner. *Glass Ind.*, **4**, 23–4(1923).—Glass to be satisfactory as a material for ovenware, must have high thermal endurance, high chem. stability, high mech. strength, and good workability. The various oxides exert a favorable influence on the important properties in the following order, the best coming first: Tensile strength—ZnO, SiO_2, P_2O_5, B_2O_3, BaO, Al_2O_3, As_2O_3, PbO, Na_2O, K_2O; expansion—B_2O_3, MgO, SiO_2, ZnO, P_2O_5, As_2O_5, PbO, BaO, Al_2O_3, CaO, K_2O, N_2O; elasticity—MgO, As_2O_5, B_2O_3, SiO_2, BaO, CaO, K_2O, Na_2O, ZnO, Al_2O_3. Stability is high for borosilicate glasses of low alkali and high silica content, especially when containing alumina. While low expansion is desirable, the other factors must also be considered. G. S. F.

32. Making of watch crystals. W. H. Holmes. *Glass Ind.*, **4**, 25–28(1923).—When the war stopped the importation of crystals, the Waterbury Watch Company undertook to make their own and gradually developed a plant which now has a capacity of over 100,000 crystals a day. A lead glass batch made with crushed silicate rock, is melted in covered 2400 lb. pots and then blown off-hand, without molds but with compressed air, to spherical globes, 10 to 12″ in diameter. These are split, then circular blanks are cut out, inspected, graded, reheated if necessary to level the edges, then the edges are ground and polished by semi-automatic machines. Higher grade crystals are specially shaped, ground and polished. G. S. F.

33. Operating continuous glass furnaces with fuel oil. W. G. Edmonds. *Glass Ind.*, **4**, 29(1923).—A discussion of the relative cost of coal and fuel oil, with suggestions as to the storage of the oil and the operation of the oil burners. G. S. F.

34. Glass manufacture with the electric radiation furnace. V. M. Sauvageon. *Glass Ind.*, **4**, 30–1(1923). Trans. of *Chimie et Industrie*, **7**, 452–5(1922).—(See *Ceram. Abs.*, **1** [9], 82(1922). G. S. F.

35. Making glass for Ford windshields. Fred S. Huntley. *Glass Ind.*, **4**, 1–5 (1923).—Illustrated description of the one furnace plant at Highland Park which is at present supplying 7 per cent of the Ford windshields required. The soda lime glass flows continuously on to a moving table which takes it under nichrome rolls and then through a 442 ft. leer. After cutting, each plate is embedded in plaster of Paris (mixed continuously in a special machine) and carried in succession under seven sand grinders, five emery grinders and a rouge polisher. The other side is then polished in the same way. Experiments to produce windshields without polishing were carried on for two years but finally given up. Construction of a four-furnace plant at River Range has just begun. G. S. F.

36. Use of fuel oil for finishing glassware. W. S. Edmonds. *Glass Ind.*, **4**, 4–5(1923).—Some suggestions for the use of oil burners in glory holes. A dry flame should be used so that carbon may give a polish to the glass. The burner should be placed in the center of the bottom and only sufficient draft used to show a little white smoke leaving the stack. G. S. F.

37. Burnt lime or limestone in glass batches. Irving E. Adams. *Glass Ind.*, **4**, 5(1923).—Comparative runs are cited which indicate that while coarsely crushed high magnesia limestone tends to give seedy glass, burnt lime is no better than finely ground limestone. Practice at present varies, burnt lime being used for bottles, tumblers, lamp chimneys, etc., while limestone is used for fruit jars and window glass. The *value*

of salt cake, 60 or 70 lbs. per batch, over straight soda-ash charge in accelerating plaining, is confirmed by a test. G. S. F.

38. Modern glass factory equipment. W. S. MAYERS. *Glass Ind.*, **4**, 7–8(1923).—Brief discussion of modern equipment for storing and handling raw materials, for mixing the batch and for conveying it to the furnace bins. The arrangement in which the batch car runs under the storage bins and discharges into an elevating and conveying system extending to the furnace bins is the most flexible. To avoid sepn. of fine and coarse materials in the furnace bin, a special design is suggested which provides plates to divide the bin into narrow vertical shutes. See *Ceram. Abs.*, **2** [2], 31(1923). G. S. F.

39. Notes on glass etching. J. B. KRAK. *Glass Ind.*, **4**, 10–11(1923).—Description of methods of producing clear and frosted etchings, with recipes for etching solutions. G. S. F.

40. Leers. W. S. MAYERS. *Glass Ind.*, **4**, 21–23(1923).—Discussion of various types, from kilns to continuous fixed pan muffle leers. Most present leers are very wasteful and inefficient but while elec. heating gives better control it is too expensive. G. S. F.

41. From manganese to selenium. I. E. ADAMS. *Glass Industry*, **3**, 219–20 (1922).—Instructions are given for changing a tank of glass from one decolorizer to the other. The following batch is included for narrow neck machine-made bottles: sand 1000, soda 390, burnt lime 110, arsenic 2, borax 2, cullet 700, decolorizer mix as needed. J. B. P.

42. Measurements on the gases evolved from glasses of known chemical composition. J. E. HARRIS AND E. E. SCHUMACHER. *Ind. Eng. Chem.*, **15**, 174–7(1922).—Glasses whose compns. run high in alkali give off more gas during their heat treatment than do those of lower alkali content. A definite relation appears to exist between the amt. of water vapor held by a glass and its alkali content. A relation, although not as pronounced as that mentioned above, appears to exist between the amt. of CO_2 held by a glass and its alkali content. Adsorbed CO_2 seems to be held to a glass primarily by primary valence forces. Adsorbed permanent gases seem to be held to glass primarily by secondary valence forces. Glass relatively free from absorbed gas can be produced by heating the glass during its melting process to a sufficiently high temp. A bibliography of 39 titles follows the article. J. B. P. (*C. A.*)

43. Pyrex glass as a material for chemical plant construction. A. E. MARSHALL. *Ind. Eng. Chem.*, **15**, 141–4(1923).—A description of the development of Pyrex for industrial use particularly in chem. manuf. Tables of properties and sp. applications are included. A. E. M. (*C. A.*)

44. Sir William Crooke's anti-glare glasses. J. H. GARDNER. *Chem. News*, **125**, 375(1922).—Historical. J. B. P. (*C. A.*)

45. A modern annealing cycle. W. O. AMSLER. *Nat. Glass Budget*, **38**, No. 29, 1, 13, 24–5, 27(1922); 3 figs.—The work of the government glass chemists on optical glass during the war is applied to the annealing of commercial bottles in the modern muffle leer. J. B. P. (*C. A.*)

46. The application of calorizing to glass making processes. S. F. COX. *Glass Industry*, **3**, 243–5(1922).—Calorized gas burners, structural shapes and supports of furnaces, recuperator tubes, valves and dampers, bolts and accessories and pyrometer tubes for leers are suggested. J. B. P. (*C. A.*)

47. Conduction process in ordinary soda-lime glass. C. A. KRAUS AND E. H. DARBY. *J. Am. Chem. Soc.*, **44**, 2783–97(1922).—The replacement of Na in glass by other metallic elements has been accomplished by electrolysis. The anode from which the metallic element enters the glass may be either an amalgam or a fused salt. Usually the glass so formed by substitution of the second metal is unstable. Na has been re-

placed by Ag to a depth of about 0.1 mm. The speed of the ions increases greatly with the temp. The cond. of glass is due entirely to the movement of the metallic Na ions. About 75% of the ions are in a condition to conduct. The rest apparently are held rigid.
C. R. P. (*C. A.*)

Heavy Clay Products

48. Tentative specification for clay sewer pipe. ANON. *A. S. T. M. Tent. Stand.*, 232, **1922.**—Cover. I. Materials. II. Size. III. Sampling. IV. Chem. tests. V. Physical tests. VI. Usual inspection. E. N. BUNTING

49. Tentative specifications for required safe crushing strength of sewer pipe to carry loads from ditch filling. ANON. *A. S. T. M. Tent. Stand.*, 237, **1922.**—A table is given covering the crushing strength as a function of the kind of ditch filling material used, breadth of ditch, and height of fill above the top of pipe. E. N. B.

50. Tentative specifications for clay hollow building tile. ANON. *A. S. T. M. Tent. Stand.*, 262, **1922.**—Detailed physical test requirements are given for compression test, freezing, and fire test. Standard sizes, workmanship, marking, and inspection methods are also listed. E. N. B.

51. Tentative definitions of terms relating to hollow tile. ANON. *A. S. T. M. Tent. Stand.*, 318, **1922.**—Definitions are given of the several kinds of tile, the clays used in making tile, and the dimensions and parts. E. N. B.

52. Burning in up-draft furnace kilns. ELIAS PETTS. *Brick and Clay Record*, **62**, 125–6(1923).—P. mentions the usual considerations of all burning problems, namely speed with which fire may be advanced without damage to ware; condition of setting, whether damp or dry; and selection of fuel. A sketch is given of the platting of an up-draft furnace kiln and bricks to be removed before fires are started are marked in diagram. P. further discusses the closing of the platting as the firing increases, also remarks smaller grate surface and air spaces in grate are necessary when burning wood than for coal, and emphasizes keeping of the kiln too tight after it is hot. When using oil as a fuel in this type of a kiln, good results were obtained in an installation having one burner to a furnace and each furnace having two arches. J. W. HEPPLEWHITE

53. Coloration, discoloration and other burning effects. ELLIS LOVEJOY. *The Clayworker*, **79**, 38–9(1923).—A discussion of scumming. Many discolorations are due to S gases and condensation of moisture on the ware in colder parts of the kiln. Improvement and perhaps complete correction can be obtained from slower water smoking, better circulation, more open kiln bottoms and stronger draft. J. W. H.

54. Building drier over kiln. ALEXIS A. ZAKHAROFF. *Brick and Clay Record*, **62**, 415–7(1923).—Description of a drier built over a kiln and sketch of same is given. Cost figures are given, estimating cost of brick at $11.00 to $14.00 per thousand by this method. Z. cites practical hints in the construction of this system gathered from observations of brick plants of this type; such as insulating outside walls, min. number of windows for illumination, side windows create cross drafts, lines for transport care should follow outside walls and should not pass through the center of the installation.
J. W. H.

55. Fire flashing. ANON. *The Clayworker*, **79**, 156(1923).—Discussion not intended as an attempt to explain flashing but to present phenomena in so far as is known. Fire flashing is a color effect produced by reducing kiln atmospheres and faces to be flashed *must be in path of flame.* Best effects are produced at cone 3 to 9; preferably the latter temp. References made to contributions on this subject by H. B. Henderson and J. Parker B. Fiske. Russet color due to amber colored hexagonal plates which owe their development to carbon, likely graphitic carbon. Graphitic carbon present probably from cracked kiln gases especially methane. Graphitic carbon acts as a catalytic agent.

Time is essential for the growth of the hexagonal crystals. Ware which scums presents widest variation in color effects. Olive greens due to limey clays and saffrons attributed to S effects in the water smoking and in incomplete oxidation. J. W. H.

56. Plant design. ANON. *Brick and Clay Record*, **62**, 236(1923).—Description of layout of Cresent China Co. plant at Alliance, Ohio, is given, pointing out labor saving devices and arrangements. J. W. H.

57. A curious defect in salt glazing. ANON. *Brit. Clayworker*, **31**, 319–20(1923).—It was noticed that sewer pipe did not glaze at the sockets. In some cases the sockets were free from the glazes on the outside as well as the inside. Salting as high as seven times did not overcome this defect. This trouble was diminished by vigorous heating prior to salting. It was found that this trouble was really due to the irregular distribution of the draft in the kiln, and by enlarging the flue leading from the kiln to the chimney and building a floor which was uniformly perforated, instead of relying on the solid floor with a complex, yet evidently inefficient arrangement of bricks above it, the pipes were glazed uniformly. The perforated floor was built of fire bricks, arranged so as to leave as many openings, each 4 in. by $2^1/_2$ in., thus passing away at almost uniform rate through every part of the floors. A few of the openings near the center of the kiln were made rather smaller than the remainder so as to counteract the greater "pull" nearer the wall. H. G. SCHURECHT

58. Clay and cement tubing. H. BURCHARTZ. *Mitt. Materialprüfungsamt*, **39**, 15–53(1921).—New data are given for compression strength and resistance to internal pressure. The stability towards acids of clay tubes and the absorption of H_2O and permeability to H_2O of both clay and cement tubing are also given. The results of each individual test are reported in detail because the deviations for tubes of similar shape and material were so large that mean values are considered unreliable. Ruptures were variable, some occurring longitudinally, others both longitudinally and transversely with rough surfaces of varying colors. The tests included tubes of clay and stoneware of circular cross-section, cement of circular cross-section and flat base, cement without base, cement without joints, cement of egg-shaped cross-section and special forms. No law was found giving any relation between size and strength. All results are in kg. per sq. cm. *Clay tubes. External pressure.* The breaking load was 2500–4000 for 80% of the tubes, with 6% below this range. The mean values of all tubes (20 to 100 cm. inside diam.) lay between 3160 and 4090. The mean of all the av. values was 3580. *Internal pressure.* The mean value (tangential stress) of all tubes varied from 34.3 to 77.7. The mean of all av. values was 59.7. *Cement tubes. Circular tubes.* The breaking load was essentially 2500–5500, with only 8% below this range and 16% above. The highest breaking loads were 7600 and 7620 for 2 tubes of 40 cm. diam. The mean values for the various sizes varied from 2630 to 5280 and the mean of all averages was 4150. *Egg-shaped tubes.* The breaking load was for the majority 4000–7000 with 17% under and 21% over this range. A tube of 70/105 cm. inside-outside diam. gave 11,010. The mean values of all sizes were 4260–8200, and the mean of all averages was 5270. By the standard test, the soly. of most of the clay tubes in H_2SO_4 was 0.04–.08%, with 1 case of 0.23%. Cement tubes immersed in 0.5% HOAc, HCl, H_2SO_4 and HNO_3 showed surface attack, due to the Ca compds. present. H_2O absorption was 2.1–5.3% for clay tubes and 7.1–7.7% for cement tubes. Cement tubes were found both porous to H_2O and waterproof. Clay tubes were those with porous surface and a H_2O absorption up to 10% and stoneware tubes as those with a vitrified surface and H_2O absorption not over 5%. C. C. D. (*C. A.*)

Refractories

59. Tentative method of test for resistance of fire clay brick to spalling action. ANON. *A. S. T. M. Tent. Stand.*, 297, **1922.**—Bricks are given a preliminary heating

for five hrs. at 1400°C. One end is exposed in door of furnace to 1350°C for one hr., then removed and put in cold running water for 3 min. Alternate heatings and coolings are made until the end of brick spalls off. E. N. B.

60. Tentative method of test for slagging action of refractory materials. ANON. *A. S. T. M. Tent. Stand.*, 293, **1922.**—A fire clay ring is cemented with refractory cement on the brick tested, and a synthetic slag placed within the ring. The prepared brick is fired to 1350°C for 2 hrs. When cold the brick is broken through the center of the ring and the penetration and attack by the slag noted and measured with a planimeter. E. N. B.

61. Dry pressing refractory shapes. L. W. FLOOD. *Brick and Clay Record*, **61**, 865–6(1922).—Stiff mud process requires a large percentage of plastic material, the same holds true of the soft mud process except in the case of silica, magnesite and chrome, also soft mud process cannot be used for manuf. of large shapes unless some supports are placed around sides of shapes when taken from mold. A high percentage of plasticity is not essential for dry press ware since pressure at times is about 5000 to 6000 lbs. per square in. Plasticity, however, should be developed to the best practical degree in order to produce the best brick possible with least expense, trouble and loss. In some cases high plasticity may cause ware to split. The addition of grog, sand or calcined material assists in overcoming this trouble. Moisture content in dry press ware usually runs about 7%. Too dry a mixture causes difficulty in handling. Homogeneity of material is important. The clay should be fed to some type of screen before going through the pan, as too large a propn. of coarse sizes reduces the plasticity of the mass, even though the clay when properly ground may be classed as plastic. It also renders the propn. of good brick more difficult and expensive. A mech. mixer is necessary and should be placed just above the press to keep the fine and coarse particles properly mixed. The clay from the mixer should have a perpendicular chute into the press. It is advisable to use as high a pressure as is possible without producing pressure checks, as high pressure makes stronger brick. F. summarizes the advantages gained by making large shapes by dry press process as follows: 1. Cost of manuf. reduced. 2. Cost of installing expensive dryers or dry floors will be lessened. 3. Resultant ware will be more uniform and exact in size. 4. Refractoriness of some clays will be increased. 5. Uniform size of ware will reduce the fire clay used in the joints. 6. Large refractory shapes made by dry press process are able to withstand thermal shock much better than the same shapes made by another process. 7. Dry press ware is a poorer conductor of heat. A diagram of a section through model dry press plant showing most important features is given. J. W. HEPPLEWHITE

62. Improvement of refractories. ANON. *Brick and Clay Record*, **61**, 867(1922).—A survey is to be conducted by the Refractories Manufacturers' Association in coöperation with various committees. Survey will consume the better part of two years and will employ the use of an elaborate questionnaire distributed among consumers of refractory brick which will include blast furnaces, stoves and connections; open hearth furnaces and metal mixers; heating, puddling and forge furnaces, cupolas; malleable furnaces, oil refineries; gas plants; glass houses; by-product coke ovens; zinc, copper and lead refineries; boilers; cement, lime and plaster kilns and kilns for burning ceramic products. J. W. H.

63. The nature of graphite and amorphous carbon. GENSHICHI ASAHARA. *Sci. Papers Inst. Phys. Chem. Research*, **1**, 23–9(1922); *Japan. J. Chem.*, **1**, 35–41(1922); cf. Debye and Scherrer, *C. A.* **12**, 786.—The essential identity of graphite and amorphous C has been established by the *X-ray analysis of 34 different forms of C* from different sources. They were ground into fine powder and pressed to layers of about 1 mm. thickness. These were fixed in front of a small window of a wooden box contg.

a photographic plate and placed in a lead camera. The interference figure of the material was recorded on the plate as concentric rings, the plate cutting the mantles of cones of the diffracted rays. Six of these cameras were arranged conically, with the vertex in the source of X-rays facing the X-ray bulb in a shielded box. The interference figures thus obtained constitute an unbroken series, gradually altering from those with 6 comparatively sharp concentric rings of intensity maxima (Type I) to those with an indistinct halo of distributed intensity (Type III). Those whose intensity maxima are not sharply defined but broadened ill-defined bands (Type II) lie between the two extremes. Certain forms of graphite, such as Ceylon and Korean graphites, etc., gave figures with radiant streaks (Type IV), the intensity maxima being common to graphites appearing intact. The streaks may be attributed to the fact that these graphites are only ground along their flat cleavage faces and the incident rays fall chiefly and almost perpendicularly on their cleavage faces. The angles corresponding to the six concentric rings, which the diffracted rays make with the incident rays, are approx. 14°, 18° 50′, 22° 20′, 25° 40′, 31°, and 36° 30′, resp. The natural and artificial graphites, however finely they may be powd., possess a cryst. structure, as they plainly show sharply defined interference rings. Amorphous C also gives interference figures, but no distinct maxima are observed owing to the distributed intensity. Their estimated maxima are however invariably at about 14° and 23°. Carbons produced by the decompn. of certain gases or vapors, such as CO, C_2H_2, or CS_2, or Fe_3C and coal, gave no sign of definite crystalline form, but they gave definite interference figures which establish their cryst. nature. The word "amorphous" must, therefore, be replaced by "extremely minutely cryst."

K. K. (*C. A.*)

64. High-temperature melting. ANON. *Iron Age*, **110**, 1507(1922).—A description of the elec. furnace equipment of the rare metal alloy refining and melting plant of the Bario Metals Corp. The equipment includes 3 graphite resistance furnaces and 1 high-frequency induction furnace. L. J. (*C. A.*)

65. Ajax-Wyatt furnace in the brass-mill casting shop. R. P. HEUER. *J. Ind. Eng. Chem.*, **14**, 1021–4(1922).—A method is developed for calcg. the proportions of a vertical ring induction furnace which will result in a well-balanced mechanism. Operating procedure and furnace schedules are discussed and a comparison is made between induction furnace and crucible melting of brass in rolling mills. L. J. (*C. A.*)

66. A new induction furnace. J. M. WEED. *Trans. Am. Electrochem. Soc.*, **42** (preprint); *Chem. Met. Eng.*, **27**, 977–9(1922).—A description of a new type of induction furnace for melting non-ferrous metals (see *C. A.*, **16**, 3814). An explanation is given of the manner in which the magnetic forces establish max. and min. fluid pressures at opposite ends of the secondary cylinder and maintain a unidirectional circulation of metal.

L. J. (*C. A.*)

67. A new cupola lining. KARK GROCHOLL. *Die Giesserei; Iron Age*, **110**, 1279 (1922).—In Germany a loose refractory mixt. is being used for ramming up the cupola lining, instead of fire brick and blocks. The cost is only $^1/_{30}$ that of fire brick. Patching is done after every heat, with unskilled labor, and a new lining is not required within 2 yrs. A. B. (*C. A.*)

68. Bavarian graphite. EUGEN RISHKEVICH. *Chem.-Ztg.*, **46**, 1013–6, 1035–6 (1922).—The graphite occurs in gneiss, replacing mica and associated with pyrite. It varies from 12 to 40%, usually 20 to 25%, C content, that under 12% not being worth mining. The ore comes in lenses, and mining is expensive. Crushing, sizing and wet concn., followed by fine grinding and concn., give a concentrate of 65% C, which can be raised to 80–90% by dewatering. Tests are described indicating the superiority of Bavarian graphite in elec. cond., heat cond., resistance to combustion, etc., when compared with other kinds. W. C. E. (*C. A.*)

69. Cement kiln insulation. P. C. Durbin. *Concrete* (Mill Section), **22**, 2–4 (1923).—The advantages of an efficient insulating material in a cement kiln are: (1) a marked saving of fuel, (2) better working conditions, (3) longer life of shell and auxiliary equipment, (4) longer life of refractories, (5) more uniform distribution of heat, (6) ease of temp. control and (7) conservation of unused heat for power production.

J. C. W. (*C. A.*)

70. A new refractory material. W. Smith. *J. West Scotland Iron and Steel Inst.*, **30**, 8–13(1922).—The new refractory is *carbonized clay*. Mixts. of C and clay are old but carbonizing by C-charged gases has never been well developed. Charging is done when the clay is in the biscuit state and at max. porosity. Shrinkage, with higher burning, then compresses the C to a d. comparable to that of steel. So long as carbonized clay remains in a reducing atm. it will withstand the highest com. temps. and is unaffected by acids. Much skill is required in the carbonizing process. Ground raw clay and coal are heated together in a muffle kiln. The evolved gases may be used for fuel and coke is obtained. Pitch may be used as a binder in forming shapes of carbonized clay. There is no after-contraction. White carbonized clay is made by burning out the C in carbonized clay. The black is suitable for heat resistance in a reducing atm., for acid-resisting ware and for abrasives. The white is suitable for heat resistance in an oxidizing atm. Carbonization may be a means of extracting Fe and alkalies from clays. The reports are based upon lab. tests. Com. tests will be made. C. H. K. (*C. A.*)

BOOK

71. A comparison of British and American Foundry Practice. P. G. H. Boswell. Liverpool, England: University Press of Liverpool, Ltd. Cleveland: The Foundry. 106 pp. $1. Reviewed in *Foundry*, **51**, 11(1923). (*C. A.*)

Whitewares

72. American and English Ball Clays. H. H. Sortwell. Bureau of Standards, *Tech. Papers* **227**.—The 21 ball clays being used in the largest quantities in the manufacture of china, semiporcelain, elec. porcelain, sanitary ware, and floor and wall tile were studied at the Bureau of Standards. Detns. were made of the water of plasticity and shrinkage relations upon drying, amount of arenaceous material retained by 120-mesh sieves, rate of flow of slips, cohesion of the plastic clay, dry transverse strength when mixed with an equal part of flint, time required for oxidation of carbonaceous material at 75°C, porosity and vol. changes from Orton Seger cone 01 to cone 12, and coloring effect in a standard body. No great differences were noted in water of plasticity, all of the clays falling within a range of a few per cent. The Dorset clays showed a slightly higher drying shrinkage than the other clays studied. All of the clays showed a tendency to warp in drying but none developed cracks. The Amer. clays were much cleaner than the English and contained less coarse mineral matter and dirt which would be removed in lawning the body after blunging. The Ky. clays were almost free from such material, and the Tenn. clays contained only a small amount, while the English clays were less desirable in this respect. The transverse strength of equal mixts. of the clays with commercial potters flint was detd. to give a better indication of the comparative bonding power of the clays in a body than would be indicated by the modulus of rupture of the clay alone. The average modulus of rupture of the Tenn. clays tested was 366 lbs. per square inch, the Ky. clays averaged 282 lbs. per sq. in., the clays from Dorset, Eng., 405 lbs. per sq. in., the Devonshire clays 443 lbs. per sq. in., and English clays, whose exact source was not known, 419 pounds per square inch. In general the English clays were stronger than the domestic, but two of the Amer. clays compared favorably with the average English clay. From the results obtained the rate of flow of slips from the

efflux viscosimeter did not appear to be a valuable criterion of the inherent plastic qualities for use in comparing ball clays. Sol. salts in the clays probably affect the results. The cohesive strengths of the plastic clays were determined at different water contents and are shown graphically. These results showed no distinctions which compared with the value of the clays for jiggering as judged by practical potters. Some of the English clays are very high in carbonaceous matter, 11 hrs. being required in two cases to completely remove the black core from specimens $1^1/_4$ by $1^1/_4$ by 2 in. The clays from Devonshire as a class required the longest time for oxidation. The Dorset clays and those from Tenn. contained a moderate amount of carbonaceous matter while the Ky. clays contained but little. It was noticed that there was a relationship between the amount of carbonaceous matter and the strength when dry, the more carbonaceous clays usually being stronger. The burning behavior of the American and English clays was radically different. The English clays vitrified at a low temperature and remained almost constant in porosity and volume up to cone 12. No evidence of overburning was noticed at that temperature. There was some variation in the burning behavior of the clays from Devonshire, but the Dorset clays underwent practically the same changes in firing. The American clays showed a gradual reduction in porosity from cone 01 to cone 12. Tenn. ball clay No. 5 was the only domestic clay which vitrified at cone 8. Tenn. No. 3 matured at cone 10, and Tennessee No. 11 and Kentucky No. 4 at cone 12. The other two Kentucky clays studied were not vitrified at cone 12. Throughout the firing range studied the American clays were constantly changing in volume. In the standard body the Tennessee clays as a class showed the best color. The Ky. and Devon clays were fair in this regard while the Dorset clays were comparatively poor in coloring effect. Although the English clays have a more desirable firing behavior and greater strength when dry, the American clays contain less material to be removed in body prepn., contain less carbonaceous matter which may lead to trouble in firing, and burn to a better color in the body. Because of their better color they may be used in larger quantities, thereby overcoming in a measure their lower strength. With a slight adjustment in flux content of the body they may be successfully used to replace the English clays. A classification of ball clays based on their properties has been drawn from the results of the work. The complete paper may be purchased from the Supt. of Documents, Government Printing Office, Washington, D. C. H. F. S.

73. Studies of changes in the physical properties of a hard porcelain caused by varying the feldspar from Na to K feldspar and by varying the burning treatment. E. Roth. *Sprech.*, **55**, 533–4(1923).—Porcelains of the following general compns. were studied: clay 50, quartz 25 and feldspar 25. K and Na feldspars of the following compns. were used.

Six	K feldspar	Na feldspar
SiO_2	64.3%	67.1%
Al_2O_3	19.4%	20.3%
Fe_2O_3	0.1%	0.3%
CaO	tr.	0.8%
MgO	0.4%	tr.
K_2O	12.9%	tr.
Na_2O	2.1%	11.8%
Ignit. loss	0.6%	0.1%

Various mixts. of Na and K feldspars were studied varying from pure Na feldspar on one extreme to pure K feldspar on the other. Porcelains prepd. with these feldspars were fired to cones 9, 11–12, 13, 14, 15, 15–16. A study of the thin sections showed that at 1120°C the feldspar melted. Upon increasing the temp. a portion of the clay substance goes into solution and the sillimanite crystallizes out. The coarse grains of crystalline

quartz do not go into solution until a temp. of 1480–1500°C are reached. Upon further heating the sillimanite crystals are taken into soln. until at 1600°C a homogeneous body is obtained. The following conclusions were drawn: (1) The K rich porcelains produce bodies having a higher viscosity than the Na rich porcelains. (2) The saturation of Na and K feldspar with clay substance was determined by means of the indices of refraction of the glass. It was found that the K feldspars dissolved 20% clay and the Na feldspar dissolved 15% clay. (3) The solubility of silica in the glass depends upon the size of grain, cryst. modification of Si and the firing temp. (4) Na feldspar exerts a stronger soln. action upon silica than K feldspar. (5) Maximum shrinkage occurred at cone 9 and above this temp. the mass commenced to swell. (6) The sp. grs. of both the Na and K bodies decreased with an increase in firing temp. (7) The linear coeff. of expans. decreased up to cones 11–14. Since the thin sections showed that at this temp. the K body had not and the Na body had only slightly dissolved the coarse quartz grains, it seems that the finely dispersed Si resulting from the dissociation of the clay is dissolved by the glass. With the Na body the decrease in expans. is very marked at this temp. (8) The translucency increased up to cones 12–14. The translucency remains about the same between cones 12–14 but when fired about cone 14 the coarse quartz grains are dissolved and the translucency increases. The Na bodies are slightly more translucent than the K bodies. (9) The impact cross-breaking test and the ball compression test gave a max. at the temp. where max. shrinkage and density is developed. Between cones 12 to 14 a small decrease in strength is obtained and above cone 14 an increase was again developed. (10) Both the K feldspar and the Na feldspar bodies gave a dielectric constant of 5.8. The elec. penetration depends largely upon the porosity of the body. H. G. SCHURECHT

74. Antimony yellow glazes. W. ROHN. *Keram. Runds.*, **31**, 31(1923).—A study was made of cone 3*a* Sb yellow Pb glazes. The success of this type of glaze depends upon (1) the constituents in the glaze, (2) an oxidizing kiln atmos., and (3) a cer-

ANTIMONY YELLOW LEAD GLAZES

1.	0.80 PbO, 0.20 K_2O	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, nice yellow, 6% HSb_2O_3, dirty (ocher yellow)
1*a*.	0.80 PbO, 0.20 K_2O	0.15 Al_2O_3 { 2 SiO_2, 0.4 B_2O_3 } + 3% HSb_2O_3, nice yellow
2.	0.80 PbO, 0.20 Na_2O	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, very nice yellow, 6% HSb_2O_3 or SnO_2, dirty color
2*a*.	0.80 PbO, 0.20 Na_2O	0.15 Al_2O_3 { 2 SiO_2, 0.4 B_2O_3 } + 3% HSb_2O_3, beautiful yellow, 6% HSb_2O_3, dirty color
3.	0.80 PbO, 0.20 MgO	0.15 Al_2O_3 2 SiO_2 + 2% HSb_2O_3, yellow, 4% HSb_2O_3, dirty, 8% pale yellow
4.	0.80 PbO, 0.20 BaO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, pale yellow
5.	0.80 PbO, 0.20 CaO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, pale yellow
6.	0.80 PbO, 0.20 SrO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3 almost white, 5% HSb_2O_3, same as with 3%
7.	0.80 PbO, 0.20 ZnO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, yellow, with 5% HSb_2O_3, dirty

tain transparency of the glaze. Excellent results were obtained with glazes having an RO composed of 0.8 to 0.9 PbO and 0.1 to 0.2 KNaO. Good colors were also obtained with glazes having an RO composed entirely of PbO. Extra good colors were obtained

with glazes having 0.1 to 0.2 Na_2O and 0.8 to 0.9 PbO. This compn. produced Neapolitan yellow shades. The alkali earths on the other hand destroy the yellow color with the exception of MgO. Although MgO prevents to a certain extent the formation of the desirable Neapolitan yellow shades it does not destroy the yellow color as CaO does. BaO acts very similar to CaO while a glaze containing 0.8 PbO and 0.2 SrO_2 produces a white glaze entirely destroying the yellow color. ZnO, Al_2O_3 and SiO_2 do not have much influence on the yellow color. B_2O_3 does not affect the color but gives the glaze a high gloss. Glaze 2*a* shown in the table produces a bright egg-yellow color which is not possible to obtain with a glaze free from B_2O_3. The addition of a small percentage of Fe_2O_3 to a yellow glaze produces an orange-yellow. Opalescent-yellow glazes have a dirty color being similar to China-reds in this respect. 1 to 3% HSb_2O_3 gives best colors. The addn. of 6% SnO_2 to a yellow glaze changes its color to ocher. With alkali earth free glazes yellows are obtained above 0.35 PbO. By changing the Al_2O_3 and SiO_2 contents glazes suitable for stoneware may be prepd. These glazes may also be used for china painting. By varying the PbO and Sb_2O_3 contents a series of colors varying from sulphur-yellows to orange-yellows may be prepd.

H. G. SCHURECHT

75. Sagger investigation. ANON. *Brick and Clay Record*, **61**, 960(1922).—Bureau of Standards are testing 52 different sagger clays sent by the consumers in order to locate the causes of sagger losses. Clays for classification purposes will be tested for water of plasticity, shrinkage, porosity, transverse strength and burning behavior at 5 different cones. J. W. H.

76. Report of committee D-9 on electric insulating materials. F. M. FARMER, *et al.* *Proc. Am. Soc. Testing Materials*, **22**, I, 472–8(1922).—Recommendations for slight changes in present tentative methods and an outline of work during the yr.

C. C. D. (*C. A.*).

Equipment and Apparatus

77. Heat insulating materials for electrically heated apparatus. J. C. WOODSON. *Trans. Am. Electrochem. Soc.*, **43**, preprint(1923).—While there are numerous grades of heat insulators, none can compare with elec. insulators. Of all the various grades there are only a few basic materials used. True insulation value lies almost entirely in the entrapped dead air spaces of the structure, and this goes back to the phys. structure of the cell or crystal. Working temp. ranges may be grouped under 5 divisions below 93°, 93–177°, 177–315°, 315–538°, 538–1093°. To cover these temp. ranges, practically all com. grades of insulators can be grouped into 3 classes as follows:—Class *A*, —18° to 93°, hair, wool, felt, wood pulp, animal and vegetable fiber, asbestos paper and cork; Class *B* (most important), 93–538°, magnesia, sponge, earths, mineral wool and asbestos; Class *C*, 315–1093°, diatomaceous earth, mineral wool, earths and silicates. Since the law of heat flow is analogous to Ohm's law 2 formulas are given. For flat surfaces with the customary units the formula is: $Q = KAt\,[(T_1 - T_2)/d]$, where Q = B. t. u. transmitted, A = sq. ft., t = time in hrs., d = thickness in inches, $T_1 - T_2$ = °F, and K = coeff. of thermal cond. = B. t. u. per sq. ft., per inch of thickness, per hr., per Fahrenheit degree. For cylindrical surfaces $Q = \dfrac{K(T_1 - T_2)}{R \log_e (R_2/R_1)}$, where R_1 = inside radius of covering in inches and R_2 = outside radius. The numerous attributes desired in insulators are outlined. Complete tables are given showing attributes of many com. grades. Curves are given which show that the const. K does not increase directly with thickness, and that its value is not const. for all temp. differences.

C. H. E. (*C. A.*)

78. Colloid mill and the ultra-filter press. A. W. KENNEY. *Chem. Met. Eng.*, **27**, 1080–5(1922).—Two types of colloid mill are described: (1) an impact mill in which the charge of liquid and ground solid is "beaten" by a toothed wheel revolving at very high velocities (up to 12,000 r. p. m.), and (2) a friction mill in which the charge is forced axially under pressure between 2 disks rotating rapidly in opposite directions. By the use of these mills it is possible to form colloidal solns. of diverse types of solids (wood, oil shale, phosphate rock, etc.), and various tech. applications are suggested. The use of the mill also has a tendency to improve reaction conditions between 2 liquids or a liquid and a solid. In the ultra-filter press the excess of dispersion medium may be removed from the colloidal soln., forming a paste of the colloid, and yielding a clear filtrate; the operation is continuous. A bibliography is given. D. W. M. (*C. A.*)

79. Suggested methods for verification of testing machines. J. A. CAPP, *et al. Proc. Am. Soc. Testing Materials*, **22**, [1], 521–33(1922).—Definitions, methods for verifying the accuracy of machines and tolerances are given. C. C. D. (*C. A.*)

80. The "Davon" micro-telescope and supermicroscope. F. DAVIDSON. *Chem. News*, **125**, 353–5(1922).—This instrument can be utilized as a telescope or microscope. When used as the latter its working distance is greater than that with an ordinary microscope. D. E. S. (*C. A.*)

BOOKS

81. Standard Specifications for Laboratory Apparatus Adopted by the Manufacturing Chemists' Association of the United States. Part I. Graduates and Thermometers. Washington, D. C.: Mfg. Chemists' Assoc. of the U. S. 49 pp. $1.50. Reviewed in *Ind. Eng. Chem.*, **15**, 214(1923). (*C. A.*)

82. Measurement of Gas and Liquids by Orifice Meter. HENRY P. WESTCOTT AND JOHN C. DIEHL. 2nd Ed. Erie, Pa.: Metric Metal Works. 434 pp. $4.50. Reviewed in *Mech. Eng.*, **45**, 148(1923). (*C. A.*)

Kilns, Furnaces, Fuels and Combustion

83. Burning brick with electricity. ANON. *The Clayworker*, **78**, 545(1922).—Expts. have been made in western Norway near Sandnes in operating brick ovens of American manuf. by electricity. Favorable results were obtained. It is calcd. with manuf. of bricks on a large scale av. consumption of electrical power would be 1 kw. per brick which necessitates cheap power rates. J. W. HEPPLEWHITE

84. Ceramic firing in electric furnaces. E. L. SMALLEY. *Trans. Am. Electrochem. Soc.*, **42** (preprint).—Properly designed elec. furnaces are entirely dependable for ceramic firing at any temp. up to 1100°. Elec. furnace firing has been used to advantage in the manuf. of grinding wheels, china, glassware, and bifocal lenses. L. J. (*C. A.*)

Geology

85. Barytes and witherite. G. V. WILSON AND OTHERS. *Memoirs Geol. Surv.* (London), **1922.** 3rd ed.—This rept. on barytes and witherite gives characters of the barium minerals; sources of supply; commercial uses of barytes and witherites; industrial notes; detailed account of the mines and present-day mining; with descriptions of methods of treatment of the ore at various places, and means of transport. The report has graphic tables showing the total output of barium minerals in the United Kingdom since 1890; also maps of barytes and witherite areas. O. P. R. O.

86. Lac, turpentine, and rosin. (India.) ANON. *Imperial Inst. Repts.* (London), **1922.**—Shellac is a characteristic Indian product, 94 per cent of the world's supply comes from India and Burma. It is a resinous exudation produced by the lac insect, *cocus lacca*,

on various trees. The lac industry in India is unsatisfactory, and recommendations for improvements are given in this report. Turpentine and rosin have been produced in India for some time, on a small scale, only one species of pine being tapped commercially, and the turpentine from this tree is inferior to that produced in the American and French forests. It appears that better turpentine could be obtained from two other trees, *pinus excelsa* and *pinus khasya*. The industry is still in the experimental stage, but might be increased in ten years to 120,000 cwts. of turpentine, and 430,000 cwts. of rosin. O. P. R. O.

87. Strontium minerals. 1913–1919. ANON. *Imperial Mineral Resources Bur.*, **1923.**—Of the strontium minerals, celestite ($SrSO_4$), the sulphate, is the most important. It is found at some localities in sufficient quantities to be quarried as a source of strontium salts. Strontianite ($SrCO_3O$), the carbonate, also occurs abundantly in some localities, it has been worked commercially, but to a less extent than celestite. Strontium compounds are used chiefly in sugar refining and pyrotechny, sometimes as a substitute for barytes in fillers, in the manuf. of chem. reagents, medicines and glass. This report gives the world's production of strontium minerals from 1913 to 1921; with brief reviews of occurrences in the United Kingdom, Canada, India, France, Germany, Sicily and the U. S., and concludes with a bibliography on strontium minerals. O. P. R. O.

88. British Columbia clay. ANON. *Brit. Clayworker*, **31**, 360.—Samples of pottery clay taken from Lilloet, Central B. C., have been declared of the very finest quality by an expert at Portland, Oregon. He declared that samples sent to him were better than any he had seen in W. Australia. O. P. R. O.

89. Bituminous sands. (Alberta.) S. C. ELLS. *Bulletin*, Lower Athabaska and Slave River District (1922).—In this bulletin issued by the Natural Resources and Intelligence Branch, Canada, Mr. Ells summarizes: An extensive deposit of bituminous sand outcrops through an aggregate distance of 200 mi., centering about McMurray. 250 exposures, all of which represent portions of one continuous deposit, have been examined and measured. The outstanding features: 1. That the deposit represents the largest known occurrence of solid asphaltic material. 2. That the deposit is, as yet, totally undeveloped. 3. That at the present time practically all asphaltic materials used in Canada are imported from foreign countries. O. P. R. O.

90. A fossil resin from British Columbia. R. T. ELWORTHY. *Can. Inst. Min. and Metallurgy Bulletin*, **130**, 29(1923).—Fossil resin in coal from Coalmont, British Columbia is reported to be amber. E. gives a brief summary of the work that has been carried out on this fossil resin in the laboratories of the Mines Branch, Department of Mines, Canada; giving chem. and phys. properties of the resin, and particularly stressing its comparison with amber; and its industrial uses. O. P. R. O.

91. Canadian kaolin. ANON. *Raw Mat. Rev.*, **2**, 97(1923).—A syndicate of Vancouver business men is now planning the exploitation of large deposits of kaolin in the Cariboo district of B. C., and proposes the establishment of a fine pottery and tile industry. The clay is pure white and Govt. analyses show it to be of excellent quality. A test made at the Govt. Laboratory, Ottawa, produced a hard, white, non-absorbent tile which takes good glaze, and is pronounced equal to any imported from England. With the addition of feldspar and ball clay, which are also found in B. C., a first class china can be manufactured from Cariboo kaolin. O. P. R. O.

92. New diatomaceous earth deposit. ANON. *The Clayworker*, **79**, 155(1923).—A new deposit of diatomaceous (infusorial) earth has been opened in Maryland on the Patuxent River east of Washington. Claimed to be the best deposit in Eastern United States. J. W. H.

93. Manufacture and uses of diatomaceous earth. ANON. *Brick and Clay Record*, **62**, 414(1923).—Methods of handling deposit of diatomaceous earth at Lompoc,

Cal. is given. Area of deposit is several square miles and ranges up to 700 feet in thickness. Principal uses of diatomaceous earth are listed as compressed brick; compressed brick midway in quality of sawed brick and ordinary fire brick; ground product used as filtering material in sugar mills; light weight filler in concrete instead of rock aggregate; insulation purposes; automobile polish, etc.; nitroglycerine absorbent in some grades of dynamite. J. W. H.

94. The physical chemistry of the crystallization and magmatic differentiation of igneous rocks. V. J. H. L. Vogt. *J. Geol.*, **30**, 611–630(1922).—The influence of pressure is discussed. In deep-seated rocks the rise of the melting point of rock-forming minerals is inconsiderable. Many minerals such as olivine, monoclinic pyroxene, feldspars, spinel, magnetite, etc., can form under either low or high pressures. Melilite is found only in extrusive types (low pressure) the corresponding intrusives containing instead olivine and anorthite-bytownite. Likewise the leucite in low-pressure rocks is replaced by microcline and biotite. The formation of garnet is favored by high pressure. **VI.** *Ibid.*, 659–72.—The influence of the light volatile compds. as H_2O, CO_2, etc., is discussed. During crystn. the vol. material will be disposed of as follows: Some will escape if the pressure is high, some will be included in the minerals as inclusions, some may enter in solid soln., some may enter the crystg. minerals as H_2O in micas, the rest will remain in the magma and be concd. in the mother liquid. It is estd. that 4% indicates the max. original content of H_2O in the parent magmas. W. F. H. (*C. A.*)

95. Graphic study of igneous rock series. F. F. Grout. *Bull. Geol. Soc. Am.*, **33**, 617–38(1922).—The nature of differentiation in 40 rock masses is shown by diagrams based on alkalies and SiO_2. Some of the conclusions are: (*a*) magmas need not be of any particular compn. in order to develop into a differential series, (*b*) the trend of differentiation is in different directions in different localities even when the magmas are similar, (*c*) nearly all alkaline rock masses have some phase near the av. nephelite syenite, (*d*) the primary magma approaches av. basalt but varies considerably. W. F. H. (*C. A.*)

96. The chemistry of the earth's crust. H. S. Washington. *Smithsonian Rept.*, **1920**, 269–319(1922).—The conditions prevailing in the earth's interior are briefly discussed, followed by a description of the general character of igneous rocks. The number of essential rock-forming minerals is small; they are silicates of Al, Fe, Mg, Ca, Na and K. The maxima and the usual range of the principal rock constituents are as follows: SiO_2, max. 99%, usual range, 75–34; Al_2O_3, 60, 20–10; Fe_2O_3, 88, 15–0.5; FeO 35, 15–0.5; MgO, 49, 25–1; CaO, 23, 15–0; Na_2O, 19, 15–0; K_2O, 18, 10–0; H_2O, 10, 2–0; TiO_2, 70, 2–0; P_2O_5, 16, 1–0; MnO, 2, 0.3–0. An estimate of the av. compn. of igneous rocks, based upon 5159 "superior" analyses is given: SiO_2 59.09, Al_2O_3 15.35, Fe_2O_3 3.08, FeO 3.80, MgO 3.49, CaO 5.08, Na_2O 3.84, K_2O 3.13, H_2O 1.14, TiO_2 1.05, P_2O_5 0.30, MnO 0.125, CO_2 0.102, ZrC_2 0.039, S 0.053, Cl 0.056, F 0.078, Cr_2O_3 0.056, V_2O_3 0.032, NiO 0.025, BaO 0.055, SrO 0.022, Li_2O 0.007%. This approximates to a granodiorite. The av. compn. of the earth's crust by elements is estd. as: O 46.43, Si 27.77, Al 8.14, Fe 5.12, Ca 3.63, Na 2.85, K 2.60, Mg 2.09, Ti 0.629, P 0.130, H 0.127, Mn 0.096, F 0.077, Cl 0.055, S 0.052, Ba 0.048, Cr 0.037, Zr 0.028, C 0.027, V 0.021, Ni 0.019, Sr 0.018, Li 0.003, Cu 0.002, Ce, etc. 0.001, Be 0.00xx, Co 0.00xx B 0.000x, Zn 0.000x, Pb 0.000xx, As 0.000xx, Cd 0.0000xx, Sn 0.0000xx, Hg 0.0000xx, Sb 0.0000xx, Mo 0.00000xx, W 0.00000xx, Bi 0.00000xx, Se 0.000000xx, Au 0.000000xx, Br 0.000000xx, Te 0.0000000xx, Pt 0.0000000xx, sum 100%. The elements are referred to two main groups in the periodic table; the petrogenic elements, abundant in igneous rocks, of low at. wt., normally occurring as chlorides, fluorides, oxides or silicates; and the metallogenic elements, rare in igneous rocks, occurring as ores of high at. wt. and forming in nature "native" metals, sulfides, arsenides, bromides, etc. The suggestion

is made that beneath a silicate crust of petrogenic elements is a zone essentially of Ni-Fe and beneath this a core of metallogenic elements. In igneous rocks and minerals the elements show a correlation of occurrence, oxides of Si, Al, K, Na tend to go together; Mg, Fe; K, Mg; Na, Fe; Na and Li, Zr, Ce, Cl, F; Mg and Pt, Cr. The idea of comagmatic regions is discussed and some are briefly described. The calcn. of rock ds. from their compn. is discussed, and the av. ds. of the continental masses and ocean floors are calcd. and shown to stand in inverse relation to their elevations. This is confirmative of the theory of isostasy. E. F. H. (*C. A.*)

BOOKS

97. High-grade clays of the eastern United States with notes on some western clays. H. Ries, W. S. Bayley, *et al.* U. S. Geol. Survey, *Bull.* **708,** 305 pp.(1922).—Statistics of production, imports and exports are given. Over 80 chem. analyses of the various clays are recorded, principally those from deposits in Pa., Va., Fla., Ala., Miss., Tenn., Ky., Ill., and Ark. Mineralogical compns., phys. tests and fire tests are tabulated in large numbers. The requisite qualities of high-grade clays for different purposes are specified. The deposits of kaolins or white residual clays are discussed in 114 pages, residual clays of undetd. derivation in 32, Indianaite in 15, sedimentary clays of the Coastal Plain and the Embayment area in 129, and the microscopic study of clays in 13. L. W. R. (*C. A.*)

98. Essentials for the Microscopical Determination of Rock-forming Minerals and Rocks. Albert Johannsen. Chicago: The Univ. of Chicago Press. $2.10. Reviewed in *Eng. Mining J.-Press,* **114,** 775(1922). (*C. A.*)

99. Elements of Optical Mineralogy. An Introduction to Microscopic Petrography. N. H. Winchell and A. N. Winchell. 2nd Ed. Revised and enlarged. Part I. Principles and Methods. New York: John Wiley & Sons, Inc. $3.50. Reviewed in *Eng. Mining J.-Press,* **114,** 1082(1922). (*C. A.*)

100. Rocks and Their Origins. Grenville A. J. Cole. 2nd Ed. Cambridge: The University Press. 175 pp. 4s. Reviewed in *Nature,* **110,** 768(1922). (*C. A.*)

101. Dana's Text Book of Mineralogy. W. E. Ford. 3rd Ed. Enlarged. New York: John Wiley and Sons, Inc. 720 pp. 31s. 6d. in Australia. Reviewed in *Chem. Eng. Mining Rev.,* **15,** 137(1922). (*C. A.*)

102. Smithsonian Institution's Study of Natural Resources Applied to Pennsylvania's Resources. Samuel S. Wyer. Washington: Smithsonian Inst. 150 pp. Reviewed in *Chem. Met. Eng.,* **28,** 130(1923). (*C. A.*)

Chemistry and Physics

103. Electrolytes' effect on plastic clay. J. D. Brumbaugh. *Brick and Clay Record,* **62,** 221–9(1923).—Purpose of investigation was to det. the effect, if any, of the addn. of small percentages of electrolytes to the water used in prepg. clay in such a state of workability for use in power molding machines. A history of the work of numerous investigators on similar problems is given and many references are cited. Two types of plastometers were used for obtaining an index of plasticity; namely the impact plastometer (Vicat needle as is used for obtaining the normal consistency of Port. cements) and constant pressure plastometer. Photos of each app., detailed construction data and operating procedures are given. Close parallelism of results were obtained in using each app., hence the impact plastometer was used for the expts. because of its simplicity and apparently greater accuracy. The behavior of the clay in the presence of the following electrolytes was investigated: $Ca(OH)_2$; H_2SO_4; NaCl; $BaCl_2$; $AlCl_3$; HCl; NH_4Cl; and NaOH. The clay used was a typical brick and hollow ware clay from

Stark County, Ohio and analyzed SiO_2 —63.62%; Al_2O_3 plus Fe_2O_3 —21.30%; CaO —1.40%; MgO —0.72%; H_2O —10.40%. B. concludes from the expts., electrolytes investigated may be grouped into 4 classes. (1) Electrolytes which cause the clay to become more fluid. HCl is in this group. (2) Electrolytes which first make the clay more fluid, while further additions decrease fluidity. NaCl and NaOH are of this group. (3) Electrolytes which first cause the clay to become less fluid until a certain limit is reached, when further addns. affect the clay in the opposite way. NH_4Cl; $AlCl_3$; H_2SO_4 are in this group. (4) Electrolytes which cause decrease in the fluidity. $Ca(OH)_2$ and $BaCl_2$ are members of this group. Under the microscope there seems to be three general classes of constituents in the clay. (1) Cryst. particles, (2) amorphous particles, (3) colloid particles. The first 2 classes remain constant in size regardless of varying degree of fluidity while colloid particles decrease in size with increase of fluidity. B. advances max. dispersion of class 3 is brought about by a certain concn. of anion which is const. for each electrolyte, and if this value is exceeded the clay becomes less fluid. Reverse probably due to attraction between particles being lessened owing to increase in osmotic pressure in interior of clots, thus decreasing amt. of sol present. When this action reaches a certain stage, the sol absorbs the salts, causing increase in fluidity. 1.5% NaCl causes greatest fluidity. J. W. H.

104. Clay-mud. H. Chatley. *Soc. of Engineers* (London), June, **1922.**—Properties of clay-mud are discussed. Clay-mud has 3 special features: (1) A granulated structure of varying degrees of fineness. (2) A semi-permanent water content, which gives it peculiar mech. properties. (3) A certain small reserve of chem. potential, which, under certain conditions, will cause it to change in various ways. Methods of observing the granular matter by means of the microscope are discussed, and C. states that the plasticity depends upon the size of the products and the proportion of colloids present. He divides the water content into 3 classes. Clay-mud containing 15% by weight of water has a tensile strength of 15 lb. per sq. in., but doubling the water content reduces the tensile strength to one-third of this amount. With 28% of water, its viscosity is about the same as a heavy grease, corresponding to a shear strain of 1 radian per 100 sec., under a shear stress of more than 100 gm. per sq. cm. It differs from heavy grease, however, in that water is extruded as the pressure is increased. It is not water-tight, and dykes allow water to percolate very slowly, but if the surface of the dyke is dry, the surface tension may arrest the flow. Conclusions conform to the common experience that water content of clay is of great importance, and they also indicate that, as with all other materials, the working stresses should be within the "elastic range." O. P. R. O.

105. Ferric oxide and alumina separated from lime. Charriou. *Compt. rend.* **174,** 750–4(1922).—A sepn. of ferric oxide and alumina from lime may be accomplished in such a way as to prevent the co-pptn. of lime with the ferric oxide and alumina: A soln. contg. 0.56 gr. of calcium oxide, 2 gr. ammonium nitrate and either 0.141 gr. of ferric oxide or 0.166 gr. of alumina is treated with 2 cc. of a soln. contg. 11 mols. of ammonia per liter, the whole dried at a temp. of 150°C approx., so that all the ammonium nitrate may not be decomposed, the resulting mass washed and taken up by decantation with boiling water. To accelerate the process: Dissolve the residue insoluble after two decantations in boiling nitric acid, decomposing it at about 250°C, and taking the residue up in 50 cc. of boiling 5% ammonium nitrate soln., the ferric oxide and alumina will then remain in a dense, granular form capable of rapid washing by decantation. To overcome the difficulty of removing the adherent oxide completely from the dish during the washing; either weigh the dish beforehand and then calcine and weigh the oxides in it, or dissolve the remaining particles of the oxides in nitric acid, reprecipitate with ammonia and filter. The total volume of the washings in all the expts. in which the lime was

subsequently estd. was 500 cc.; the amounts of ammonium nitrate introduced were found to be without influence on the estn. of the calcium as oxalate. O. P. R. O.

106. Colloid chemistry, general and industrial applications. ANON. Dept. Sci. and Indus. Research, *Fourth Rept.*, **1922.**—Colloid chemistry subject matter in these reports is considered under two heads, (1) subjects mainly academic in nature, (2) subjects mainly technical. Each section has been written authoritatively, by a specialist on the subject which he treats. Under the first head are grouped: Colloids in analytical problems, cataphoresis, colloid systems in solid cryst. media, mol. attraction, membrane equilibria, disperse systems in gases, the theory of lubrication, and the application of colloid chemistry to mineralogy and petrology. Under the second head are grouped: Colloid chemistry of soap boiling, flotation processes, catalytic hydrogenation, the rôle of colloids in metal deposition, rubber, and colloid fuels. O. P. R. O.

107. Quantitative analysis of clays. O. BOUDOUARD AND J. LEFRANC. *Bull. Soc. Chim.*, **31,** 1145–52(1922).—Methods for qualitative and rational analysis are given in full with notes. O. P. R. O.

108. Barytes standardization. T. M. LOWRY. *Bull. of Indian Industries & Labour*, **22,** p. 10.—The question of standardization has recently been investigated by T. M. Lowry on behalf of the Assoc. of Br. Barytes Producers. According to the tests generally applied in the mills are those in which the foreman rubs the barytes on his thumb nail and from experience is able to grade the material, or it is rubbed on one hand and shaken on to the other, the grade being determined from the quantity shaken off. Testing with the microscope is more precise, but has limitations by reason of the small amount which can be examined. It is necessary to supplement this information by some further test, therefore Dr. Lowry has evolved a new process of testing powdered barytes in which a current of water traveling at a rate of 7 mm. per sec. is made to carry over the finer particles and leave the heavier ones behind in a graduated tube. With this app., which is simple in construction and easy to work, it is suggested that five standard grades should be recognized and adopted. The percentages of residue for these five grades are: 0.1; 1.2; 2.4; 4.8; 8.16. No satisfactory method of measuring the color of bleached barytes seems to have been devised and standardized and at present it is done entirely by arbitrary visual methods. O. P. R. O.

109. Physical properties of clay. A. S. E. ACKERMANN. *Society of Engineers, Trans.*, **1919–20–21–22.**—Physical properties of clay and the effect of water content upon their properties has been discussed by Mr. Ackermann during the last four years. He describes experiments, and shows that clays, like certain metals, have a certain measure of fluidity. When a disc resting on clay is loaded the disc sinks into the clay, the amount it descends depending on the load and on the time allowed; and when the load exceeds a certain amount, which depends upon the amount of water present, the rate and extent of penetration are considerably increased. The stress at which this occurs he calls the pressure of fluidity. His experiments have been directed toward determining the bearing power of soils, and the load that can be safely applied to them. The American Society of Civil Engineers has issued a series of reports, prepared by a special committee, to codify present practice on the bearing values of soils for foundations, and has emphasized the importance of the colloid content of clay. Most of the grains of the minerals in the clay are enveloped by colloid, but quartz grains do not, as a rule, have the colloid coating. The plasticity of the clay depends upon the amount of colloid present. To separate the colloidal from the granular material, the clay is revolved at 40,000 r. p. m. in a separator. (*Nature*, **111,** 1923.) O. P. R. O.

110. The effect of U_3O_8 upon the fusibility of Zettlitzer kaolin. O. KALLAUNER AND J. HRUDA. *Sprech.*, **55,** 523(1923).—In order to det. the effect of U_3O_8 upon Zettlitzer kaolin mixts. of varying compns. were melted in an electric furnace. The

kaolin had the following analysis: SiO_2 47.39%, Al_2O_3 37.74%, $Fe_2O_3(SiO_2)$ 0.72%, CaO 0.16%, K_2O 0.52%, ignit. loss 13.58%. The different mixts. and their softening points are given below:

Kaolin per cent	U_3O_8 per cent	Cone	Kaolin per cent	U_3O_8 per cent	Cone
100	..	35	50	50	15
99	1	34	40	60	17
95	5	33	20	80	30
90	10	32	10	90	34–35
80	20	31	..	100	35+
60	40	18	..	..	..

H. G. SCHURECHT

111. Research in Georgia clays and bauxite. ANON. *The Clayworker*, **79**, 274 (1923).—Outline of research of certain Ga. clays under a coöperative arrangement with Bureau of Mines is given and embraces whiteware clays, refractory clays, and bauxite, and vitrified face brick. J. W. H.

112. The B. t. u. chart. C. J. LOHMAN, JR. *Chem. Met. Eng.*, **27**, 1031(1922).—This chart is so constructed as to indicate directly the heat value of a fuel, given the corrected temp. rise of the calorimeter, thermometer and the % of moisture in the charge. H. L. O. (*C. A.*)

113. Purification and analysis of zirconium dioxide. F. G. JACKSON AND L. I. SHAW. *J. Am. Chem. Soc.*, **44**, 2712–14(1922).—Fusion for 1 hr. of 1 pt. oxide to 4 pts. of an equal mixt. of borax and soda ash dissolved 60–70%. When the fusion is taken up in dil. HCl the insol. residue cannot be sepd. by filtration. By pptg. the hydroxide with NH_3 the residue was held in this ppt. which could be washed free of borates and chlorides. By repeatedly pouring a slight excess of warm HCl over the ppt. the hydroxide can then be dissolved and the soln. filtered clear. Addn. of a very little H_2SO_4 then pptd. the basic sulfate which could be coagulated by heating nearly to boiling and washed free from Fe and Al. Most of the Ti is pptd. Attempts to det. Zr by volatilization of the fluoride in absence of H_2SO_4 were not successful. Twelve successive treatments with H_2F_2 reduced the residue to 2%. A. R. M. (*C. A.*)

114. A preliminary study of zirkite ore. J. G. THOMPSON. *J. Phys. Chem.*, **26**, 812–32(1922).—Zirkite (baddeleyite) ores are studied with a view to improving their refractory properties by the elimination of certain impurities. 90–95% of the SiO_2 in the raw material may be removed by heating a mixt. of the ore with just enough coke to convert the Si to the carbide, in an electric furnace, to a temp. above 2220°. With C in excess, the removal is incomplete. If the Fe be then removed by treatment with Cl or phosgene, zirconia sufficiently pure for refractory purposes might be obtained. Methods of *analysis of Zr compds.* are briefly reviewed, and a scheme for the detn. of Zr, Si, Fe, and Ti is outlined. E. F. H. (*C. A.*)

115. Surface tension in solids. G. N. ANTONOFF. *Z. physik. Chem.*, **102**, 388–92 (1922); cf. *C. A.*, **13**, 274.—A mathematical relation has been deduced for the internal pressure (P) of solids. From the values obtained for the breaking-load of rock salt crystals it is shown that $P/p^{1/3} = 1.4$ dynes/cm.^{2}, where $p = 1/d^3$ and d is the attraction between the doublets. If the attraction between the charges is not influenced appreciably by the neighboring series (of doublets), the above value for $P/p^{1/3}$ represents the surface tension in the direction of the vertical axis. If the field is sym. in all directions to the equiv. axes, then it represents the surface tension of rock salt in all 3 directions. H. J. C. (*C. A.*)

116. The full effect of variable head in viscosity measurements. F. M. LIDSTONE.

Phil. Mag., **44**, 953–5(1922).—Additional corrections in the treatment of the variable head in viscosity measurements (cf. *Ceram. Abs.*, **1** [8], 198(1922)). S. C. L. (*C. A.*)

117. Film method for measuring surface and interfacial tension. A. W. Fahrenwald. *J. Optical Soc. Am.*, **6**, 722–33(1922).—The accuracy is discussed of each of the following methods of measuring surface tension: (1) drop wt., (2) capillary rise, (3) Jaeger, (4) vibrating jet, (5) method measuring the tension required to detach a ring, sphere, or disk from the surface of the liquid, and (6) film method. For oil-water emulsions where the surface tension depends upon the age of the surface, the film method gives the most dependable results. The instrument, which essentially consists of a liquid container, knife edge, automatic balance, pointer and scale, is carefully described. A measurement consists in lowering the knife edge into the liquid, then lowering the liquid until the edge is just about to be detached from the liquid. The liquid container is then lowered very slowly until the pointer is seen to slip back a few divisions which indicates the formation of the film. For most liquids the film lasts several seconds holding the pointer motionless at a given point on the scale. With small corrections, this method can be used for any liquid. By substituting a special frame plate for the knife edge, the tension existing at a liquid-liquid surface can be as readily measured as for the previous liquid-air surface. The instrument is standardized to read directly in dynes per cm. with the value of the surface tension of water, 72.8 dynes per cm., as the basis. The instrument is easily constructed and gives values easily reproducible to 0.1 dynes per cm. E. F. P. (*C. A.*)

118. The application of colloid chemistry to mineralogy and petrology. Alex. Scott. *Brit. Assoc. Advancement Sci.*, 204–44, **1922.**—This report treats (I) of the general aspects of colloid chem. applicable to mineralogy and petrology: (1) weathering, (2) cementation, (3) adsorption, (4) determination of colloidal character or origin, (5) dendritic structure, (6) anomalous double refraction, (7) igneous rocks. (II) Rocks and minerals which either exist in colloidal form or are derived from colloidal material: (1) metals, (2) sulfur, (3) carbon, (4) silica, (5) agate, (6) bauerite, (7) chert and flint, (8) siliceous sinter, (9) alumina, (10) Mn oxides, (11) Sb oxide, (12) MgO, (13) Sn oxide, (14) Mo oxide, (15) ice, (16) sulfides, (17) silicates of Al, (18) silicates of Fe, (19) zeolites, (20) serpentine group, (21) other silicates, (22) carbonates, (23) sulfates, (24) phosphates, (25) arsenates, (26) antimonates. A very large number of references are given. J. A. (*C. A.*)

119. The Michell viscosimeter. J. L. *Technique moderne*, **14**, 360–1(1922).—The viscosimeter consists essentially of a metal cup and a metal ball fitting very accurately in the cup. The cup is provided with 3 small projections, so that the distance between the ball and cup is accurately known (of the order of 0.01 mm.). The cup is provided with a hollow handle for the insertion of a thermometer. To carry out a detn., pour a few drops of oil in the cup, place the ball and press it firmly into the cup, reverse the position of the instrument, and note the time required for the sphere to fall. The time multiplied by the const. of the instrument gives directly the viscosity in dynes per cm.^{2} Detns. with this app. agree closely with those obtained with the Redwood viscosimeter. The Michell detns. required two hours and the Redwood nearly two days. The theory of the instrument is briefly explained. A. P.-C. (*C. A.*)

120. The flow of liquids under capillary pressure. E. K. Rideal. *Phil. Mag.*, **44**, 1152–9(1922).—A capillary tube of glass 1.2 m. long and 0.708 mm. av. internal diam. was mounted horizontally in a condenser tube maintained at 20°. The liquid under examn. was then drawn back and forth by suction several times to wet the wall thoroughly, and finally was forced back to a point 15 cm. from the beginning of the capillary, from which point measurements were made of the rate of penetration. The liquids examd. were isobutyl, isopropyl, allyl, Et, and Me alcs., water, water-Et alc. mixts.,

$CHCl_3$, C_6H_6, Et_2O, Me_2CO and AcOEt. The rate of advance into the capillary of a liquid under its own force is: $t = (2\eta/\gamma^r)x^2 - (\delta r^2/\gamma\eta)\log x$ in which t is the time, η the viscosity, γ the surface tension, x the distance traversed, and δ the d. of the liquid. For relatively large capillaries the *penetration coeff.* is $\sqrt{\gamma r/2\eta}$. The exptl. detn. of the coeff. is shown to agree with calcn. In the case of mixts. the dynamic surface tension and not the static values are probably the governing factors. The reciprocal of the penetration coeff. is proportional to the sq. root of the period of mol. relaxation as defined by Maxwell, and by analogy with reactions in the solid state is probably important in reactions taking place in liquid media. S. C. L. (*C. A.*)

121. Films. The spreading of liquids and the spreading coefficient. W. D. Harkins and A. Feldman. *J. Am. Chem. Soc.*, **44**, 2665–85(1922).—A theoretical paper in which it is shown that the criterion of spreading or non-spreading of liquids may be presented in a very simple way in terms of a simple and thermodynamically detd. coeff., termed the *spreading coeff.* This coeff. is defined as $S = Wa - Wc$, where Wa is the work of the surface adhesion and Wc the work of the surface cohesion of the liquid. A positive value of S corresponds to spreading, a negative value to non-spreading. Expts. were made with org. liquids on the surface of water and *vice versa*, and with org. liquids and H_2O on the surface of Hg. Almost all org. liquids spread on H_2O, while H_2O spreads on very few org. liquids. The non-spreading of org. liquids on H_2O is brought about by the presence in the org. mol. of Cl, Br, I, =S, =CS, or by Ph groups. Monomol. films are produced on H_2O only when the spreading coeff. has a relatively high value. These high values seem to occur only when the spreading substance has a polar group in its mols. H. J. C. (*C. A.*)

122. A molybdenum resistance vacuum furnace. P. Fleury. *Compt. rend.*, **175**, 880–2(1922).—Molybdenum wire is wound on an alundum core and surrounded by alundum. This is sealed in a vacuum iron case. The furnace can be used to 1700°. A. H. D. (*C. A.*)

123. Identity of amorphous and crystalline silicon. W. Manchot. *Z. anorg. allgem. Chem.*, **124**, 333–4(1922); cf. *Ceram. Abs.*, **1** [8], 206(1922).—X-ray examn. of the 2 forms of amorphous Si by Debye has shown them to be cryst. and to have the same diamond-like structure as the ordinary form. M.'s assumption that the differences in chem. properties shown by these forms were due solely to greater ratio of surface to mass is thus firmly established. The following additional observation on the chem. behavior of these pseudo-amorphous varieties is appended. When the black variety, obtained by quenching its soln. in metals, is rubbed with PbO_2, it flames vigorously even in the cold while the yellow-brown variety obtained by action of H_2F_2 on the black variety explodes violently when rubbed with PbO_2. A. R. M. (*C. A.*)

124. Simple apparatus for comparing the thermal conductivity of metals and very thin specimens of poor conductors. M. S. Van Dusen. *J. Optical Soc. Am.*, **6**, 739–43 (1922).—The method consists in comparing the temp. gradients in two materials placed in series, the rate of flow in each being the same. App. for this investigation is fully described and data are given for contact material including dry boundary, contact water, mineral oil, and various thicknesses of paper and mica, between two horizontal cylinders. The thermal conds. of Zn, Al, Sn, Pb, and Navy brass detd. in this app. check previous values in every case within 5%. E. F. P. (*C. A.*)

125. A problem in viscosity: The thickness of liquid films formed on solid surfaces under dynamic conditions. Research Staff of the General Elec. Co., London. (Work conducted by F. S. Goucher and H. Ward.) *Phil. Mag.*, 44, 1002–14(1922).—The detn. of the thickness of the liquid layer coating a solid body drawn out of a liquid is discussed theoretically and practically. It is shown that if the solid is a flat slab of infinite width, the forces detg. the thickness are those of gravity (g) and viscosity (η)

and the relation between thickness (t), density (ρ), and the velocity of drawing v_0 is: $t^2 = 2v_0\eta/\rho\ g$. If the solid is a fine wire of radius r, surface tension is dominant and gravity negligible. If γ is the surface tension, the relation must be of the form: $t/r = f(\eta v/\gamma)$. It is found empirically that $f(\eta v/\gamma)$ is of the form: $4.8\ \eta v/\gamma$ in c. g. s. units. These results apply to suspensions if, (1) the diam. of the suspended particles is not greater than t, (2) if the effect of the particles in increasing η is taken into account. There is no evidence of any special cohesion between solids and liquids wetted by them other than that which prevents slipping at the interface. S. C. L. (*C. A.*)

126. Colloidal systems in solid crystalline media. Cecil H. Desch. *Brit. Assoc. Advancement of Sci.*, 4th Report, 33–40, **1922.**—The first part reviews some of our present knowledge on the colloidal dispersion of some of the constituents of *steel* and *alloys*, and even the *iso-colloidism of pure metals*. Since "the dimensions of the grains are considerably above the limits which are usually assigned to the colloidal state, it is unlikely that any advantage would be gained by including this aspect of the structure of metals under the heading of colloid chemistry." [This is erroneous, because the effects of subdivision transcend the limits mentioned. Besides, visible grains, metals and alloys contain in addition truly colloidal particles. J. A.] A brief very incomplete section on the "*Coloring Matters in Crystalline Minerals*," is also included.

J. A. (*C. A.*)

127. A small high intensity mercury arc in quartz glass. L. J. Buttolph. *J. Optical Soc. Am.*, **6**, 1066–71(1922).—This illuminator is a self-contained unit furnished to operate on 110 v. either a. c. or d. c. The effective light source has an area of $^1/_4'' \times 1^3/_4''$ and is provided with a removable mica filter for absorption of extreme ultra-violet, an adjustable slit, and a light-tight holder for filters. By use of Cornings G555P and G34 glasses λ 5461 may be isolated; or by use of Noviol A and G 585 glasses λ 4359 may be obtained as monochromatic light sources. By use of Wratten filters other lines may be isolated. The instrument has two operating conditions. With enough resistance in series it is a low pressure arc giving only the strongest spectrum lines, and if operated at highest intensity it changes to a high pressure arc giving a continuous spectrum with additional Hg lines. D. E. S. (*C. A.*)

BOOKS

128. Tested Methods of Non-Ferrous Metallurgical Analysis. Seymour Pile and Reginal Johnston. London: H. F. and G. Witherby. 128 pp. 7s. 6d. Reviewed in *Chem. News*, **125**, 208(1922); *Chem. Trade J.*, **71**, 396(1922) and *Chem. Age* (London), **7**, 492(1922). (*C. A.*)

129. The Chemical Analysis of Rocks. H. S. Washington. 3rd Ed. Revised and enlarged. New York: John Wiley & Sons, Inc. 271 pp. $2.50 (12s. 6d.) (*C. A.*)

130. Handbook of Chemical Engineering. 2 Vols. Edited by Donald M. Liddell. New York: McGraw Hill Book Co. $8. Reviewed in *Chem. Met. Eng.*, **27**, 1184 (1922). (*C. A.*)

131. Textbook of Chemical Engineering. Edward Hart. 2nd Ed. revised. Easton, Pa.: Chemical Publishing Co. 241 pp. $4. Reviewed in *Chem. Met. Eng.*, **27**, 757(1922). (*C. A.*)

General

132. Largest brick plant in the world. Addie M. Wallace. *The Clayworker*, **79**, 146–49(1923).—Description and photos of Simons Brick Co. various plants at Los Angeles, Calif. and vicinity. J. W. H.

133. Common Brick Manufacturers' Association meeting. Anon. *The Clay-*

worker, **79**, 140–42; 170(1923).—A review of C. B. M. A. convention held in Cleveland, Ohio, Feb. 5, 6 and 7. J. W. H.

134. National Brick Manufacturers' Association convention. ANON. *The Clayworker*, **79**, 125–38, 237–73, 288, 290, 292(1923).—Verbatim report of 37th annual convention of N. B. M. A. held in Cleveland, Ohio, Feb. 7, 8 and 9. J. W. H.

135. Hollow Building Tile Association convention. ANON. *The Clayworker*, **79**, 152–3(1923).—A review of the 5th annual meeting of H. B. T. A. held in Chicago, Ill., Jan. 25 and 26. J. W. H.

136. Silver jubilee convention of The American Ceramic Society. ANON. *Brick and Clay Record*, **62**, 319–22, 352–4, 356–8(1923).—A report of convention activities and the salient points of papers presented in the various divisional meetings. J. W. H.

137. Common Brick Manufacturers' Association convention. ANON. *Brick and Clay Record*, **62**, 310–5(1923).—Report of annual convention at Cleveland, Ohio, Feb. 5–7. J. W. H.

138. National Paving Brick Manufacturers' Association convention. ANON. *The Clayworker*, **78**, 559(1922).—A review of the annual meeting held Dec. 12 and 13, at Cleveland, Ohio. J. W. H.

139. Silver jubilee convention of American Ceramic Society. ANON. *The Clayworker*, **79**, 150–1, 172, 181–2, 184.—A review of the 25th annual convention held in Pittsburgh, Pa., Feb. 12–16. J. W. H.

140. Annual meeting of New Jersey Clay Workers' Association and Eastern Section of American Ceramic Society. L. W. ALLISON. *Brick and Clay Record*, **62**, 48(1923).—A report of the annual meeting held at Rutgers College which includes salient points of papers delivered in symposiums on casting of ceramic wares and oil burning. J. W. H.

141. Annual convention of Hollow Building Tile Association. ANON. *Brick and Clay Record*, **62**, 210–3(1923).—A report of H. B. T. A. convention at Drake Hotel, Chicago, Ill., Jan. 25 and 26, 1923. J. W. H.

142. Canadian convention. ANON. *Brick and Clay Record*, **62**, 218–9(1923).—A report of joint convention of Canadian National Clay Producers' Association and The Western Ontario Clay Workers' Association in Hamilton, Ontario, Jan. 23–25. Plant problems constituted the major part of the program. J. W. H.

143. American Face Brick Association convention. ANON. *Brick and Clay Record*, **61**, 858–62(1922).—Report of convention at West Baden Springs Hotel, West Baden, Ind., Dec. 5–7, 1922. J. W. H.

144. Cleveland, a clay center. ANON. *The Clayworker*, **79**, 23–34(1923).—A description of 18 clay products plants located in Cleveland which produce common, face and paving brick, sewer pipe and hollow tile. Also unusual features in equipment and methods of operation. J. W. H.

145. American Face Brick Association convention. ANON. *The Clayworker*, **78**, 546–51(1922).—A review of the annual meeting of the A. F. B. A. at West Baden. J. W. H.

146. A refractory survey (proposed). ANON. *The Clayworker*, **78**, 568(1922).—A contemplated survey sponsored by the Refractories Manufacturers' Association. The purpose of which is to uncover a mass of information with regard to furnace conditions as in actual service. Progress reports will be made as information is gathered. J. W. H.

147. Research bureau laboratory, Standard Steel Car Co. RICHARD RIMBACH. *Chem. Met. Eng.*, **28**, 110(1923). E. J. C. (*C. A.*)

148. The electric steam generator. HORACE DREVER. *J. Ind. Eng. Chem.*, **14**, 923–5(1922).—The elec. generation of steam by passing a. c. (usually high tension)

directly through the water is economical for utilization of off-peak power and is generally profitable in localities where hydroelectric power is abundant but fuel is expensive. An elec. steam generator of 1000 kw. capacity is equivalent to a boiler of 100 h. p. (cf. also *Elec. World*, **80**, 1211–2(1922)). L. J. (*C. A.*)

149. Some recent developments of powdered-coal firing. J. S. Atkinson. *Iron Coal Trades Rev.*, **105**, 924–7(1922).—The prepn. and utilization of powdered coal are discussed in connection with its drying, pulverizing, burning, and the removal of the ash. The turbo-pulverizer is especially recommended (cf. *C. A.*, **16**, 1001). Under usual working conditions an efficiency on boiler, superheater and economizer of 86% can be obtained and maintained with pulverized coal. J. L. W. (*C. A.*)

150. Gasification of Ohio coals. D. J. Demorest. *Chem. Met. Eng.*, **27**, 1172–5, 1221–4(1922).—The suitability of Ohio coals for gas manuf. was studied in a vertical retort of commercial size. The methods of operation of the retort and various methods of control analyses are also given. The data are tabulated and discussed. Coke suitable for domestic heating but inferior for metallurgy was obtained. A little less tar and about the same amts. of NH_3 were produced as from standard gas coal. About the same vol. of gas as from standard gas coal but with lower calorific value was obtained. W. A. M. (*C. A.*)

151. The commercial application of electroösmosis. J. H. Frydlender. *Rev. prod. chim.*, **25**, 721–30(1922).—A review of the theoretical principles of electroösmosis and electrophoresis and of their application to drying peat, purifying and molding clay and kaolin, prepn. of colloidal SiO_2, purification of tan liquors, tanning of hides, sterilizing and improving foodstuffs, preservation of green fodder, purification of glues and gelatins, prepn. of pure serums, extn. of sugar from molasses, decolorizing sugar juices, purification and elimination of alkaloids, purification of crude glycerol, prepn. of $Al(OH)_3$, and dehydration of coloring matters. The article is based very largely on the patent literature. A. P.-C. (*C. A.*)

152. Powdered coal as fuel in steam plants. H. Kreisinger and J. Blizard. *Proc. Eng. Soc. Western Penn.*, **38**, 169–200(1922).—Three groups of tests using powd. coal on a 3-pass Edge Moor boiler equipped with a "Lopulco" furnace and the results of a 9-day test on 2 Stirling boilers are reported. Overall thermal efficiencies of from 80% to over 90% were obtained. Drawings of furnace settings, the burner for powd. coal, the isothermal lines in operation of a furnace burning powd. coal, together with graphs showing the % CO_2, excess air, temp. of flue gas and uniformity of furnace conditions with variable load are given. Prevention of the destruction of furnace lining by high temp., easy removal of ash, effect of a water screen in the furnace and recent improvements in furnace design are discussed. Much valuable information comparing stoker fired furnaces with those burning powd. coal is contained in the extended discussion which follows the article. W. W. H. (*C. A.*)

153. The protection of brass weights. J. J. Manly. *Phil. Mag.*, **44**, 948–50 (1922).—A modification of a method first used by Faraday to protect Fe from rust, is applied to brass wts. The wts. are tooled to remove tarnish, polished, heated in a semi-luminous gas flame until nearly red hot and then plunged into boiled linseed oil and left to cool. After removal and washing with turpentine and polishing with old linen, the wts. are adjusted, standardized and put into use. Modern coal-gas contains too much S for direct heating, and it was found necessary to use a vitreosil crucible with lid or a muffle. After cleansing and polishing each wt. is covered with a thin layer of linseed oil and then placed on a 3-point porcelain support in the crucible or muffle just above a layer of asbestos. Heat is applied until a golden tint is observed, when the heating is ended and after cooling an even coating is obtained which weighs about 0.05 mg. per sq. cm. of surface. S. C. L. (*C. A.*)

154. Commercial electro-thermic processes. II. Bruno Waeser. *Chem.-Ztg.*, **46,** 928–30(1922); cf. *Ceram. Abs.*, **2** [2], 19(1923).—The methods of *fusing silica* and the use of elec. furnaces in *melting and mfg. Fe and Fe alloys* are briefly surveyed. Among the alloys of Fe are included those with Si, Mn, Al and Ti. **III.** *Ibid.*, 947–8.—The *manuf. of ferro-Cr, ferro-Ni and ferro-Mo, CaC_2, Al, P and CS_2* are briefly reviewed. Numerous places are mentioned at which the processes are being carried out. **IV.** *Ibid.*, 970–2.—Brief review of *Zn melting and refining, manuf. of cement and steel;* use of elec. heating in *coal distn., fixation of N_2* in the arc; and elec. *steam generation.*

M. K. (*C. A.*)

155. The control of works operations by scientific instruments. Leonard Levy. *Chem. Age* (London), **7,** 734–7(1922).—A brief outline of the application to works control of the X-ray tube, refractometers, spectrometers, viscosimeters, pyrometers and the like. W. H. B. (*C. A.*)

156. Earning power of research as demonstrated by the experience of the American Rolling Mill Company. D. M. Strickland. *Ind. Eng. Chem.*, **15,** 78–9(1923).—By adequate support of a no. of research problems, it is contended that at least 1 problem will be successfully solved and repay the entire research expense. C. C. D. (*C. A.*)

BOOKS

157. Filtration. T. Roland Wollaston. London: Sir Isaac Pitman & Sons, Ltd. 102 pp. 2s. 6d. Reviewed in *Chem. News*, **125,** 270(1922). (*C. A.*)

158. Discoveries of the Twentieth Century. Edward Cressy. London: Routledge & Sons, Ltd. 12s. 6d. Reviewed in *Chem. Trade J.*, **71,** 770(1922). (*C. A.*)

159. The Wonder Book of Chemistry. Jean H. Fabre. Translated from the French by Florence C. Bicknell. New York: The Century Co. 385 pp. $2.50. Reviewed in *Am. J. Pharmacy*, **95,** 65(1923). (*C. A.*)

160. Scientists' Reference Book and Diary, 1923. Manchester: Jas. Woolley Sons & Co., Ltd. 174 pp. 3s. 6d. Reviewed in *Pharm. J.*, **109,** 563(1922). (*C. A.*)

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Vol. 2 June, 1923 No. 6

Author Index[1] to Abstracts for June

Author	Number of abstract
Adams, F. W.	39
Amenomiya, Y.	37
Andersen, O.	57
Anon.	2, 3, 7, 8, 22, 23, 25, 26, 27, 28, 29, 31, 43, 49, 50, 51, 53, 54, 61, 88, 121, 122, 126, 129
Arnold, V.	15
Beecher, M. F.	1, 76
Beecher, M. F. and Booze, M. C.	67
Bell, H.	138
Bentz, H.	118
Blakeslee, H. J.	119
Brown, A. E.	52
Buckman, H. H. and Pritchard, G. A.	81, 82
Budnikov, P. P. and Syrkin, J. K.	10
Carpenter, C. H.	102
Clamer, G. H. and Wyatt, J. R.	105
Clapp, H. B.	83
Darling, C. R.	123
DeLuca, D.	104
Desenberg, J.	34
Drake, J. W.	143
Driscoll, R. A.	109
Duckham, A. M.	124
Dundon, M. L.	41
Dworzak, A.	125
Elwood, H.	84
Emerson, J. W.	20
Feldenheimer, W. and Plowman, W. W.	134
Ferrari, F.	11
Fieldner, A. C.	130
Fischer, R.	96
FitzGerald, F. A. J.	106
Flugge-de-Smidt, R. A. H.	98
Forsyth, G. M.	5
Foster, C. E.	87
Fox, C. A.	18
Frohman, E. D.	77
Gaskill, J. A.	78
Gaston, R. M.	120
Goddard, W. T.	12
Gray, J. H.	79
Hadley, H. L.	56
Herrmann, R.	116
Hirsch, H.	65
Holtedahl, O and Andersen, O.	62
Holz, H. A.	97
Jeffery, J. A.	75, 92
Jeppson, G. N. and Beecher, M. F.	94
Kamita, K.	32
Keele, J.	128
Keeney, R. M.	73, 103
Keinath, G.	100
Klinck, O.	99
Knowles, J. A.	36
Kôno, S.	47
Ladoo, R. B.	58, 137
Lafon, P.	42
Lebrun, R.	127
Lillibridge, H. D.	91
Little, G. M.	101, 113
Loeser	30
MacMichael, R. F.	117
Malmed, A. T.	21
McDermott, G. R.	141
McDougal, T. G. and McDowell, S. J.	90
Meston, A. F.	145
Middleton, J.	142
Moore, W. E.	68, 69, 70
Moore, W. E., Alter, H. F., Hantf, E. A., Eckley, J. R. and Wright, F.	107
North, C. L.	17
Norton, L. E.	135
Odelberg, A. S. W.	95
Olsson, Z.	80
Peerson, A. H.	108
Pite, A. B.	4
Prausnitz, P. H.	132
Ratner, L. and Schwarz, M.	111
Rees, W. J.	60, 63, 64
Reid, T. A.	111, 112
Rennerfelt, I.	72
Ricketts, E. B.	139
Riddell, W. C. and Schuette, C. N.	9
Sampson, E.	59
Samsioe, C. A. R.	23
Scharschu, C. A.	66
Schmidt, B.	55
Schreiber, P.	131
Snyder, F. T.	71
Sperr, F. W. and Rose, H. J.	110
Stafford, C. S.	45
Steinhardt, A.	93

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Author Index to Abstracts for June (*Continued*)

Author	Number of abstract
Sugizaki, M.	14
Sumner, W. E.	19
Takahashi, R.	13
Tanaka, H. and Shikenjo, T. K.	133
Taylor, W. C.	44
Teisen, T.	35
Tenen, H. T.	6
Turner, W. E. S.	40
Turner, W. E. S. and Cousen, A.	38
Turner, W. E. S., Dimbleby, V., and Dickenson, A. W.	33
Vernon, H. M.	85
Wang, G.	89
Warrin, E.	48
Wedgwood, P. and Hodsman, H. J.	141
Welles, C. E.	146
White, G.	86
Windett, V.	140
Wirrer, G. and Moyer, A. C.	115
Wyatt, J. R.	74
Yamamoto, T.	46
Yamamoto, R.	16
Young, G. J.	136
Zulauf, R.	24

Abrasives

PATENT

1. Safety-tread tile. M. F. Beecher. U. S. 1,439,285, Dec. 19. Si carbide granules forming the main portion of the tread surface of tiles are united into an integral porous mass by a porcelanic bond. Cf. *Ceram. Abs.*, **1** [3], 82(1922). (*C. A.*)

Art

2. Uranium protoxide in Czecho-Slovakia. Anon. *Jour. Royal Soc. Arts*, **71**, 258.—Oxide of black blende, or pitch ore, otherwise known as protoxide of uranium is one of the valuable minerals obtained at the State mines of Jachymov in W. Bohemia, according to a rept. by the U. S. Consul at Prague. This mineral is used in the prepn. of uranium colors and radium, owing to the fact that the Czecho-Slovak Govt. has a monopoly of the production of radium and other precious minerals, a special permit is necessary for their purchase. O. P. R. O.

3. Art and its application to the pottery industry. Anon. *Pottery Gaz.*, **48**, 106–8 (1923).—A rev. of an address by Joseph Burton. J. W. H.

4. Ceramics in the field of architecture. Arthur Beresford Pite. *Pottery Gaz.*, **47**, 736–8(1922).—An address. J. W. H.

5. Lustered pottery: ancient and modern. Gordon M. Forsyth. *Pottery Gaz.*, **48**, 95–7(1923).—F. classifies lustered pottery into 2 classes, namely true lusters fired in a reducing atmosphere and false lusters fired in ordinary atm. in a muffle furnace. Historic side of luster decorations is given. Process of applying luster and method of firing is outlined. J. W. H.

6. Classifying and measuring color by the Ostwald method. H. T. Tenen. *Am. Dyestuff Rep.*, **12**, 127–32(1923). E. J. C. (*C. A.*)

Cement, Lime and Plaster

7. Waterproofing cement. Anon. *Chem. Age* (London), **8**, 238(1923).—"Kynazite," a prepn. for waterproofing cement and mortar, has been tested at the College of Tech., Manchester, with good results. This substance is used to replace a propn. of the sand used in manuf., and according to the tests proves an effective waterproofer of mortar and cement in all cases, even for water under pressure, the imperviousness being increased by increasing the propn. of the product. The strength of the materials as detd. by compression tests was found to be slightly greater than ordinary cement and mortar. Concrete made with kynazite replacing the whole of the sand content was found to be highly water resisting, but in this case the strength was only about 50%

of that of plain concrete. It is manufd. by Kynaz Products Co., Ceinws, Montgomeryshire, Eng. O. P. R. O.

8. German research institute for slag-cement. ANON. *Jour. Soc. Chem. Indus.*, **42**, 306.—The Ger. slag-cement indus. has now gained a position of equal importance with the Port. cement indus. and a new Research Institute has been formed and opened at Düsseldorf. O. P. R. O.

9. The production of caustic calcined magnesite in the Scott furnace. W. C. RIDDELL AND C. N. SCHUETTE. *Eng. Mining J.*, **114**, 981–4(1922).—The Scott fur. (commonly used to treat fine mercury ores) is described. Such fur. has been successfully used since 1920. Producing caustic magnesia for use in Sorel cement. Figures on cost and opern. given. Also data on rate of decompn. of different magnesites. S. L. G.

10. Setting and velocity of solution of burnt gypsum. P. P. BUDNIKOV AND JA. K. SYRKIN. *Bull. Inst. Polyt. Ivanovo-Voznesensk.*, **6**, 235–47(1922).—The authors have investigated the velocities of dissolution of gypsum after the latter had been heated at various temps., the concns. being detd. at different stages of the dissolution by means of cond. measurements. For the samples which have been heated at 115° and 125°, the cond. and hence the soly. increases rapidly to a point corresponding with a soln. considerably supersatd. with respect to $CaSO_4.H_2O$, and afterwards diminishes, at first rapidly and then slowly, but still indicates a certain degree of supersatn. after 24 hrs. Supersatd. solns. are obtained also with gypsum heated at 400°, but not when a temp. of 500° is reached. In so far as the setting of gypsum is conditioned by crystn. from supersatd. solns., the temp. at which "dead-burnt" gypsum is formed may therefore be assumed to be about 450°. Burnt gypsum may be regarded as consisting of two components, one sol., which dissolves readily, and the other relatively insol. The soly. of samples which have been burnt at temps. between 500° and 800° is rapid at first, this being explained by the presence of appreciable proportions of the sol. modification in dead-burnt gypsum. The time occupied by dissolution does not furnish an exhaustive explanation of the disappearance of the ability of gypsum to set, and the authors suggest that the presence of the insol. component in the interstices of the crystals prevents the latter from growing. J. C. S. (*C. A.*)

PATENTS

11. Cement mixture. F. FERRARI. U. S. 1,444,309, Feb. 6. A cement mixt. (adapted for withstanding sea water or water containing sulfates) is prepd. by grinding pozzuolanic substances and a special cement contg. Fe_2O_3 and Al_2O_3 free of aluminates and ferrites of Ca, proportioned according to the amts. of available CaO and sand in practical use. (*C. A.*)

12. Elastic cement. W. T. GODDARD. Can. 227,950, Jan. 16, 1923. A cement contains a non-friable aggregate, part of which is initially coated with rubber. Cf. *Ceram. Abs.*, 1 [7], 193(1922). (*C. A.*)

13. Elastic cement. RISSYO TAKAHASHI. Japan. 40,020, Sept. 10, 1921. Thirty parts of soln. of $Al_2(SO_4)_3$ or $BaCl_2$ of 12°Bé. is gradually added to a mixt. of $BaSO_4$ 100 and Turkey red oil 30 and thoroughly mixed together; the insol. elastic substance sepd. from them is completely washed with H_2O and dried *in vacuo*. It is then used for replenishment or manuf. of plastic materials. (*C. A.*)

14. Waterproof tile. MANZO SUGIZAKI. Japan. 40,080, Sept. 28, 1921. Tile prepd. from mortar or cement is heated to about 120°, painted with Japanese lac and then covered with Cu powder. It is once more heated at about 120°. It is resistant to heat and H_2O. (*C. A.*)

15. Continuous updraft vertical shaft lime kiln. V. ARNOLD. U. S. 1,439,597, Dec. 19. (*C. A.*)

16. Magnesia plaster. R. YAMAMOTO. U. S. 1,436,747, Nov. 28. Asbestos or other fibrous material 10, is mixed with MgO 40, pigment 5, powd. peanut shells 5 and a concd. soln. of $MgCl_2$ 44°Bé. dissolved in dil. $Pb(OAc)_2$ soln. 2 parts, to form a plaster which is rendered relatively non-hygroscopic. (*C. A.*)

17. Bricks. C. L. NORTH. U. S. 1,440,234, Dec. 26. Bricks are molded from a mixt. of ground clinker and ash from a coal furnace, lime and H_2O, and are cured with steam under pressure. (*C. A.*)

18. Building block composition. C. A. FOX. U. S. 1,442,764, Jan. 16. A heated mixt. of earthy and oleaginous materials such as earth and asphalt is extruded from a die press and cut into building blocks. (*C. A.*)

19. Floor covering material. W. E. SUMNER. U. S. 1,442,012, Jan. 9. A floor covering material is formed of a waterproofed flexible substance, *e. g.*, felt impregnated with asphalt, with an underlying layer of a mixt. of montan wax, rosin, paraffin and pigment. (*C. A.*)

20. Plaster wall board. J. W. EMERSON. U. S. 1,439,954, Dec. 26. A plaster board is formed largely of plaster of Paris reinforced near its surface with wire cloth or similar material and waterproofed by a gypsum and stearate mixt. (*C. A.*)

21. Strengthening composition for cement mixtures. A. T. MALMED. U. S. 1,436,276, Nov. 21. A mixt. of diatomaceous earth and $CaCl_2$ or similar materials is used for strengthening port. cement concretes and mortars. (*C. A.*)

Enamel

22. Origin of chamotte. ANON. *Brit. Clayworker*, **31**, 371.—There have been many discussions as to the nature of "chamotte" and the origin of this term, and it was for long thought to be derived from "chamois," the cream color of lightly burned firebricks having some resemblance to chamois leather. More recent researches in Germany seem to show a much earlier origin, and suggest that the word was originally "Schlammotte" meaning burned mud. One of the earliest uses of the work (then spelled "Chamotte") is in a document in connection with the Brueckeberger Porcelain Works, in 1793; in this document it relates, as now, to broken saggers used as grog. (*Tonindustrie Zeitung.*) O. P. R. O.

23. Cleaning enamel. ANON. *Oil & Color Trade Jour.*, **63**, 308(1923).—Paste for cleaning metal, horn, enamel, etc. (German pat. 337,066, C. A. R. SAMSIOE, Stockholm.) This paste consists of a mixture of bicarbonate of soda and glycerine, with which may be incorporated coloring, flavoring, and perfuming agents. Being sol. in water, the paste can be readily washed off after use. O. P. R. O.

PATENT

24. Enamel-coated writing tablets. R. ZULAUF. U. S. 1,438,154, Dec. 5. A first enamel coating of ordinary compn. is applied to sheet Fe and "stoved" and a finishing enamel is then "stoved" upon the first coat. The finishing coat is prepd. by grinding a fused enameling mixt. of ordinary compn. with a considerably larger addn. of clay than usually employed. This second coat gives a dull or mat finish. (*C. A.*)

Glass

25. Simpson continuous leer conveyor. ANON. *Glass Worker*, **42** [21], 19(1923).—Parts, construction and opern. of continuous leer developed by Simpson Foundry and Engineering Co., detailed briefly. R. J. M.

26. Decorating table glassware in colors. ANON. *Glass Worker*, **42** [23], 19 (1923).—How ware is decorated at Factory D, U. S. Glass Co. Color applied by spray or by hand and fired in a decorating leer. R. J. M.

27. Standard milk bottles. ANON. *Glass Worker*, **42** [23], 25(1923).—Laws in various states are not uniform as to size, shape and marking on bottles, hence much unnecessary expense in manuf. 23 sizes of caps are in use to-day. R. J. M.

28. Glass industry (Ceylon). ANON. *Pottery Gaz. & Glass Trade Rev.*, **48**, 419(1923).—A sand, which is of excellent quality and highly suitable for making glass, has been discovered in Ceylon, and a factory for its utilization is now being erected at Henaralgoda, about 20 mi. north of Colombo. M. N. Maru, a Japanese, has left for home to obtain the machines necessary for the factory. Considering the large import trade in glassware, the prospects are good provided coconut shells can be used as fuel, as coal is dear and scarce, and the coconut shells are available in large quantities at cheap prices. O. P. R. O.

29. Non-shattering glass. ANON. *Chem. Trade Jour. and Chem. Eng.*, **71**, 456 (1922).—A newly patented glass that does not shatter consists of alternate plates of thin glass and celluloid, treated with a solution of fusel oil, camphor, and methyl salicylate. The assembled laminae are immersed in the solution at a temperature of 75–95°, and pressure is applied to the whole as the temperature is gradually increased, thus firmly cementing the plates together. O. P. R. O.

30. Glass furnace temperatures. LOESER. *Keram. Rundsch.*, **30**, 48(1922).—The detn. of temp. which was reported was made with materials furnished by a German gold and silver ore establishment, on the m. p. of fusible cones and pure salts. In the flame of a Nehse-Dralle fur. of the basin system, a temp. of from 1600° to 1650° was detd. On the surface of the glass the temp. ran from 1497° to 1526°. In the two flues, one recorded a temp. of 1320°, the other 1385°. O. P. R. O.

31. Mirror glass industry (France). ANON. *Jour. Royal Soc. Arts*, **71**, 258 (1923).—The Fr. Mirror Glass Indus. will have regained its former importance within a year or two, according to competent authorities. A thoroughly modern factory is under construction at Compiégne, near Paris, and reconstruction work at Cirey is progressing rapidly. O. P. R. O.

32. Effect of alumina in retarding the devitrification of glass. K. KAMITA. *Pottery Gaz.*, **47**, 1369(1922).—The expts. reported in this paper are confined to window glass. Alumina was added in progressive series from 0.0% to 5.0%. A definite increase in the devitrification temp. was obtained as the percentage of alumina began. A regular curve was obtained indicating that with 5% alumina, incipient devitrification set in above 850°C. The expts. did not include the effect that alumina had upon the upper devitrification temp. J. W. H.

33. The mixing of batch. W. E. S. TURNER, V. DIMBLEBY AND A. W. DICKENSON. *Pottery Gaz.*, **47**, 1033, 1035, 1037(1922).—Authors discuss mixing of glass batch. Attention should be directed to having ingredients introduced at a uniform size, to the d. of the particles and the moisture content must be considered. Machine mixing produces a more homogeneous finished product than is generally obtained by hand mixing. J. W. H.

34. Process of manufacturing optical glass. J. DESENBERG. *Jour. Soc. Chem. Indus.*, **42**, 184A(1923).—A recent Ger. patent. A melt differing in av. compn. is solidified and powdered. Melts similarly treated but differing in compn. both from the previous melt and from that of the prescribed glass are added. Alternatively individual components of the glass may be added. In either manner a mixt. approx. as nearly as possible in average compn. to that of the prescribed glass is produced and melted. Waste glass may be used up in this manner, and a good yield of glass of definite optical properties obtained. O. P. R. O.

35. Improvements in the design of recuperative glass pot furnaces. T. TEISEN. *Pottery Gaz.*, **48**, 89–92(1923).—A description of a recuperative glass pot fur. of the

author's design. One of the advantages of this design was increased security against leakages obtained by the crosswise arrangement of air channels in relation to waste gas channels as well as an interlocking principle on which the tubes are made. J. W. H.

36. Processes and methods of mediaeval glass paintings. J. A. KNOWLES. *Pottery Gaz.*, **47**, 1685–8(1922).—Rev. of an address by J. A. Knowles. J. W. H.

37. Devitrification caused upon the surface of sheet glass by heat. Y. AMENOMIYA. *Pottery Gaz.*, **47**, 1369(1922).—Results of expts. with sheet glass show that devitrification takes place more and more rapidly as the temp. is increased within the zone of 700° to 800°C and that this particular temp. range constitutes the danger zone in the drawing of sheet glass cylinders. Cf. *Ceram. Abs.*, **1** [11], 290(1922). J. W. H.

38. The production of colorless glass in tank furnaces. W. E. S. TURNER AND A. COUSEN. *Pottery Gaz.*, **47**, 568–70(1922); **48**, 87, 89(1923).—Results of a study of effect of selenium in decolorizing a soda lime glass under varying conditions. The batches under consideration are as follows:

Sand	100	100	100	100
Soda Ash	37	36	35	33
Limespar	20	20	20	20
Sodium Selenite	0.0065	0.0065	0.0065	0.0065
Selenium	0.003	0.003	0.003	0.003
Cobalt Oxide	0.0005	0.0005	0.0005	0.0005

All meltings were held at temp. of 1370–1380°C for 3 to 3½ hrs. It was found (1) the max. percentage of iron oxide in the glass which it was found possible to decolorize, either with selenium or sodium selenite, was 0.09 with a further allowance of possible 0.01 for commercially produced glass; but the smaller the iron oxide content, below 0.09, the better was the glass in appearance. (2) Presence of saltcake, even in very small amts. in the batch called for an increased amt. of selenium for decolorizing purposes. (3) Saltcake batch appeared to be more corrosive on the fire clay material than the corresponding soda ash batch; hence the amt. of iron oxide content in the glass increased and decolorizing became more difficult. (4) There was evidence of the reaction of selenium with saltcake at high temp. and this tended towards the formation of a colorless compd. in the glass. (5) Sodium selenite was found more effective than selenium, and even 1/32 of an ounce was found to be more than sufficient for decolorizing under ordinary conditions. Same melts were performed in lined pots. Lining consisted of china clay (iron content 0.7%) and 5% feldspar. The resulting melts had an iron oxide content no greater than 0.05% in 3 hrs. and 0.09% from 8 to 9 hrs. Arsenious oxide was added in some cases. The results obtained are summarized as (1) it seems evident that arsenious oxide and salt cake both act in same way, *viz.*, to reduce the excess color due to selenium, even when the selenium is present in fairly large amts. (2) This effect, apparent at the end of three hrs. continues for at least 8½ hrs. at 1300 to 1400°C. (3) Used alone, selenium or sodium selenite, at any rate in amts. normally employed for decolorizing, would give the yellowish brown color noticeable at 1300°C but more pronounced at 1400°C; but the presence of arsenious oxide or saltcake alone, or probably even the 2 together, tends to prevent formation of this color. (4) Sodium nitrate, contrary to expectations, increases the color of selenium on melting for 3 hrs. and tends toward production of a pink tint. Longer melting gives an increase of the yellowish brown color, and after 8½ hrs. but little difference between the soda ash batch and nitre batch can be observed. It is unnecessary to exclude sodium nitrate from a batch for a selenium decolorized glass. J. W. H.

39. The manufacture of white flint glass in a tank furnace. F. W. ADAMS. *Pottery Gaz.*, **47**, 1031–3(1922).—The large market for white flint glass is that of food con-

tainers. Observations of manuf. of white flint glass in a 110 T. tank capable of 25 T. as a nominal output per day. Suitable tank is essential in production of white flint glass; tank must be sufficiently long and deep for melting and fining to be complete. Ends of tank must be large enough to permit metal to settle and attain uniform viscosity. Attention must be directed to quality of tank blocks—in general the higher the percentage of soda in the batch the higher should be the Al_2O_3 content of the block. MnO_2 and selenium are 2 substances in general use as decolorizers. The merits of these are discussed. Temp. of 1350–1400°C gives good results for white flint mixt. intended for automatic working. A. summarizes as follows: Complete analyses should be made of all batch materials especially the decolorizer. Total iron content in finished glass must be maintained constant; fresh components of metal should be checked regularly by complete analyses; careful weighing and efficient mixing of batch ingredients is essential; melting temp. should be kept constant by use of pyrometers; leer temp. should be correctly ascertained for a given type of glass and maintained constant by a temp. recorder. Advisable to have two recorders in leer to maintain a definite temp. gradient. Articles differing greatly in wt. should not be placed in same leer. When correct amt. of decolorizer has been found for batch with given amt. of iron content in total mix and with due regard to fur. conditions then the remaining variables could be stabilized. For discussion of this paper see *Pottery Gaz.*, **47**, 1208–10(1922). J. W. H.

40. Heat resisting glasses. W. E. S. Turner. *Engineering*, **115**, 274(1923).—In a recent lecture before the Royal Soc. of Arts, T. dealt with the problem of the need for glasses capable of withstanding sudden changes of temp. without fracture, experienced in many industries, notably those requiring miners' lamp glasses, water gage glasses, etc. He pointed out that expts. had been made chiefly in the direction of treatment of the glass after manuf. in a manner somewhat similar to that now adopted by metallurgists for the heat treatment of steels. Owing to the uncertainty of the effects obtainable, the results had been unsatisfactory. The problem has now been attacked from another direction, investigation showing that the "thermal endurance" of a glass varied inversely as the coeff. of expansion, which in its turn is dependent upon the chem. compn. Further researches showed that the use of B_2O_3 and SiO_2 lowered the coeff. of expansion, and in "Pyrex" 11.90% B_2O_3 and 80.62% SiO_2 are used, which give a coeff. of expansion of 37.2×10^{-7}, whereas an ordinary silica-lime glass is about 100×10^{-7}. A drawback, however, is the difficulty of manuf. due to the high melting temp. necessary and the very short range of plasticity; this has led to the investigation as to the possibility of using the oxides of zirconium, thorium and titanium. Up to the present results show that although glasses produced possess greater mech. strength, at the same time they also introduce additional disadvantages. A discussion followed in which the suggestion was made that the introduction of TiO_2 in quantities up to 5% increases the workability in the blow-lamp flame and also that the use of the oxide of thorium increases the range of plasticity. Pure fused silica has advantages in that it has a coeff. of expansion only one seventh of "Pyrex." O. P. R. O.

41. A glass-metal joint. M. L. Dundon. *J. Am. Chem. Soc.*, **45**, 716–7(1923).—A successful method of joining soft glass and Cu and Cu-plated steel tubing is described. E. J. C. (C. A.)

42. Anomalies in the expansion of glasses. Pierre Lafon. *Compt. rend.*, **175**, 955–8(1922).—The curves showing the expansion of glass may be divided into 4 parts: (1) a linear part giving the ordinary coeff. of expansion; (2) a part in which irregular effects occur owing to annealing; (3) a reversible change of vol.; (4) a part in which the glass becomes soft and finally molten. It is claimed that the reversible change (3) is due to an allotropic change in the amorphous silica similar to that which takes place in melted S. E. D. W. (C. A.)

43. The problem of carboy closure. ANON. *Chem. Met. Eng.*, **27**, 1267–8(1922).—Carboys with chipped or cracked necks may be reclaimed by grinding the necks sufficiently to make the surface smooth. The app. is illus. and its operation explained. The smooth surface means a saving of plaster of Paris; it is cleaner; better closure is obtained; and disputes between buyer and seller are eliminated. The cost of reclamation is 10 c. per carboy. W. H. B. (*C. A.*)

PATENTS

44. Glass composition. W. C. TAYLOR. Can. 227,457, Dec. 26, 1922. A glass contains over 70% SiO_2, over 2% B_2O_3 and a halogen compd. Cf. *Ceram. Abs.*, **2** [3], 64(1923). (*C. A.*)

45. Furnace for molten glass. C. S. STAFFORD. U. S. 1,443,767, Jan. 30. The walls of the furnace are formed of blocks or slabs of refractory material the outer faces of which are treated with waterproofing material, *e. g.*, brass, cement, or enamel, so that cooling liquid can be applied directly to them without damage. (*C. A.*)

46. Continuous cooling furnace for glass vessels. TAMESABURÔ YAMAMOTO. Japan. 40,047, Sept. 20, 1921. (*C. A.*)

47. Glass-melting furnace. SADAJIRÔ KÔNO. Japan. 40,098, 40,099, and 40,100 (additions to 35,150). Sept. 28, 1921. Diagrammatical descriptions. (*C. A.*)

48. Metallic decorations on china or glass. E. WARRIN. U. S. 1,438,799, Dec. 12. A design is printed upon the article to be decorated and the portion of the article not to be decorated is covered with an acid-resisting paste. The article is then immersed in HF soln. and the etched portion is filled with a Ag soln. which is subsequently fused into the material and then successively electroplated with Cu and Au. (*C. A.*)

Heavy Clay Products

49. White glazes for red burning clays. ANON. *Brick Pot. Trade Jour.*, **31**, 32–3(1923).—High opacity is necessary in glazes to cover the red body of the ware. This opacity may be produced with SnO_2. To prevent glazes rich in SnO_2 from peeling or crazing, the clay must contain at least 30% $CaCO_3$. For such clays the glaze must be fully matured at cone 05a (1000°C). Two glazes are available, a raw glaze rich in galena and a fritted glaze which is preferable because it is superior in quality. A raw glaze suitable for this purpose is as follows: Tin ashes 43, galena 32, and flint 25. Good fritted glazes are as follows:

	Frit				
	A	B	C	D	E
Feldspar	32	..	..	..	7
Cryst. Borax	27	..	..	..	..
Boracic Acid	..	..	..	1	..
Whiting	6	..	8	..	..
Red Lead	23	39	31	64	..
Flint	12	36	41	25	33
Tin Oxide	..	9	14	..	..
Potash	..	16	..	..	..
Soda Ash	..	..	6	..	14
China Clay	..	..	..	10	6
Tin Ashes	..	..	..	..	40
	Mill Batch				
Frit	100	..	100	100	..
China Clay	7	..	13	4	..
Whiting	..	..	..	1	..
Red Lead	..	..	..	1	..

Glazes A and D contain no Sn and are therefore less opaque than they might be, yet are suitable for purposes where great whiteness is not required. They are sufficiently fusible to enable one to add 10% SnO_2 if desired. H. G. S.

50. Burning bituminous shale. ANON. *Brit. Clayworker*, **31**, 317–18(1923).—The addn. of sand increases the porosity and greatly facilitates the burning since it aids the combustion of the carbonaceous matter without any serious risk of spoiling the brick. The critical period is between the dullest visible red to a bright red heat. The air supply should be carefully controlled at red heat. If the air supply is too great it will increase the temp. too rapidly vitrifying the surface and thus causing the same trouble that an insufficient supply of air does. The brick should not be fired above red heat until all of them have become oxidized as detd. by draw trials. Brick made of bituminous shale can be fired satisfactorily in a continuous kiln, provided they have a sufficient number of chambers. With great care a 12-chamber continuous kiln can be used, but not economically, and kilns with 18 to 25 chambers are much more suitable. At least 4 chambers should be preheated by waste gas and if this number can be increased to 6 chambers, it is better. Allowing 2 chambers for smoking, 1 being filled, 1 being emptied, and 6 chambers cooling gives a total of 17 chambers, but if the brick are to be thoroughly well burned it will usually be necessary to have 2 chambers at full fire thus making 18 chambers a minimum. Some shales require as many as 10 chambers in the preheating zone. Other shales are so rich in bituminous matter that they can be burned in continuous only when the various chambers in the kiln can be worked independently. H. G. S.

51. Salt glazing brick. ANON. *Brit. Clayworker*, **31**, 356–7(1923).—The brick to be salt glazed may be made (*a*) by hand and allowed to stiffen on a drier floor, (*b*) by the wire cut process and then repressed, (*c*) by the stiff plastic process and (*d*) by the semi-dry process. The brick should be placed in the kilns in a careful and systematic manner in such positions that the faces and ends to be glazed are exposed to the atmos. of the kilns, while all other faces and ends may be "covered" by placing them in close contact with one another. There must be sufficient open space for the salt to have ready access to the bricks or the glazing will be imperfect. Some firms prefer to arrange the bricks in narrow walls or blades about 10 in. wide, while others arrange them in the form of a checkerwork or honeycomb. The salt glazing is accomplished in a manner similar to that used for glazing sewer pipe. The amt. of salt required varies with the clay, but with care 10 to 20 ozs. per cu. ft. of kiln capacity will suffice. H. G. S.

52. Brick roads for Britain. A. E. BROWN. *Brit. Clayworker*, **31**, 346(1923).—The subject was dealt with by Mr. Brown before the Inst. of Clayworkers (London). The transformation in character of road traffic and its increased volume during the last few years has changed the problem of road construction considerably. The change is manifested in reduction of horse-drawn traffic, increase of motors, increase in axle load and speed. The essential properties necessary to stand up against these changes are: (1) durability, (2) foothold, (3) ease of repair, (4) economy of maintenance. Roads carrying large motor traffic are subjected to shock caused by the increased axle load accompanied by increased speed, and also to attrition of its surface due to the physical effects of the pneumatic tires. Asphalt and tar macadam do not stand the strain of this double attack very long, and repair is necessary much sooner than would be credited. B. then explains the advantages of the brick road, referring to many examples in Amer. roadmaking. In durability it comes higher than any other with the exception of the granite set road which however, comes lower in the attrition test. Vitrified brick, hard and dense in quality is the ideal material although others have been used with satisfaction and the only physical test of any value is the standard rattler test used in Amer. but unknown in Eng. In the test the ideal is that the bricks submitted

to it should not lose more than 22 to 24% of weight, but bricks losing as much as 39% have been used satisfactorily. According to all Amer. authorities the brick road is superior to any other and its qualities are: (1) It is impermeable; (2) durable; (3) gives perfect foothold; (4) requires the least tractive force; (5) is suitable for all gradients; (6) and for all classes of traffic; (7) is practically noiseless; (8) is easily cleaned; (9) yields no mud or dust; (10) is easy to repair; (11) is cheapest by far to maintain; (12) can be laid with smaller camber; (13) is not influenced by climate; (14) is easily opened and reinstated when pipes, etc., have to be laid; (15) improves with use. The standard rattler test is explained and also methods of laying; approx. cost of a sq. yd. of brick paving is 8s. 9d. as compared with 6s. 6d. for tar macadam and 10s. 6d. for asphalt carpet. The slightly greater cost is negligible when compared with the shorter life and greater maintenance cost of the latter two. B. concluded with the suggestion that an association be formed to conduct expts. in Eng. and a discussion followed by the members of the Inst. O. P. R. O.

53. Glazing bricks. ANON. *Raw Materials Rev.*, **2**, 109(1923).—Under a Ger. specification, a coating-compn. to be applied to concrete, sandstone, clay, brickwork, or the like, consists of water and finely sifted cement, with a water-proofing ingredient, such as a bituminous, resinous, or wax-like substance or a metallic soap. Suitable soaps are obtained by using a mixt. of alk. soap with ammoniacal zinc soln. or ammoniacal or alk. soln. of copper, lead, tin, chromium, or aluminium hydroxides, or a mixt. of calcium suboleate and aluminium sulphate. O. P. R. O.

54. New brick plant. ANON. *Brick and Clay Record*, **62**, 509–13, 516–17(1923).—Diagram and photos of new brick plant of Glouinger and Co., Vanport, Pa. Plant produces waterproof brick. Description of unique efficiency layout, incorporating automatic clay crushing and grinding; vibrationless brick machine unit; handling of drier cars without switch, turntable or transmission; signal system in drier and remarkable storeroom. J. W. H.

PATENTS

55. Clay flux for brick compositions. B. SCHMIDT. U. S. 1,442,585, Jan. 16. A flux for use with clay in brick manuf. is formed from pulverized glass, salt, pulverized granite and oxidized Zn. (*C. A.*)

56. Clay pavement. H. L. HADLEY. U. S. 1,441,342, Jan. 9. The surface of a formed clay pavement is fired to harden it. (*C. A.*)

Refractories

57. Quartz (Norway). OLAF ANDERSEN. *Norges Geologiske Undersokelse.*, **103**(1922).—Quartz, comparatively pure, occurs in S. Norway, the quantity available by quarrying from surface now exposed is estd. at from 4 to 500,000 T. Analyses are given. Assays show that two out of 7 samples contained insignificant amts. of gold and silver. O. P. R. O.

58. Bauxite: Occurrence, mining and uses. RAYMOND B. LADOO. *Eng. Mining Jour.*, **114**, 805–9(1922).—Arkansas produced (1920) over 90% of U. S. bauxite or about 60% of the world output for that year. Manufacture of abrasives and refractories consumes from 10% to 20% of domestic product. Bauxite (high grade) melts at 1820°C, Al_2O_3 at 2050°C. Bauxite brick are chem. inert at high temp. Alundum, adamite, alowalt, aloxite, metalite, rex, oxalumina, are some of the trade names of more or less pure Al_2O_3 produced from bauxite. La Farge cement, fused cement, "cement fondu" are names for high alumina (40%) quick setting and hardening cements. S. L. G.

59. The marketing of chromite. EDWARD SAMPSON. *Eng. Mining Jour.*, **115**, 356–8(1922).—Chromite is the only ore of chromium and its compds. Theoretically,

Cr_2O_3 68%, FeO 32%; Al_2O_3 and Fe_2O_3 may partly replace Cr_2O_3 and MgO and FeO. Little or no chromite is normally produced in U. S. New Caledonia, Rhodesia, India, main producers, Turkey in Asia, Russia and Greece less important. Refractories consumed 35% of chromite brought into U. S. in 1922. Chemicals 25% and ferro chrome 40%. Chromite for refractories should be low in silica. Analyses of representative ores given. Marketing, prices, production and imports charted 1909–1922.

S. L. G.

60. The durability of refractories. W. J. Rees. *Pottery Gaz.*, **48**, 453–8(1923).—A general paper on refractories, a considerable portion of which advocated the use of silica brick for construction of the by-product coke oven. A discussion followed the paper.

J. W. H.

61. Glass house refractories. Anon. *Pottery Gaz.*, **47**, 727, 729, 731, 733, 735 (1922).—A lengthy discussion of failures in refrac. materials for glass house use.

J. W. H.

62. Dolomite (Norway). Olaf Holtedahl and Olaf Andersen. *Norges Geol. Undersokelse.*, **102**(1922).—Dolomite, pure and fine grained, occurs in N. Norway. Preliminary expts. on burning dolomite are described. Small charges of dolomite were heated elec. to observe the degree of sintering attained and the dusting due to impurities of silicates or quartz in the dolomite. Each example was examd. under the microscope before and after the ht. treatment: htg. for 2–5 hrs. at about 1400°C did not produce any effective sintering of the varieties of pure dolomite. Dusting had no harmful effect in the samples examd. Structure and size of grain of the raw dolomite had no predominating influence on the corresponding properties of the burned product. The mixt. of lime and magnesia forming the results of the burning were always very fine grained. A brief review is given of the more promising methods for utilization of dolomite as an industrial raw material. Among the methods mentioned is elec. sintering and melting of dolomite exptd. on by a Norwegian firm, Ostlandske Stenexport Co. References are given to U. S. Bur. of Mines pubs. It is briefly indicated which methods might be used in attempting the exploitation of dolomite in Norway, the most recommendable way seems to be to try one of the methods suggested for the sepn. of lime from dolomite possible in connection with elec. sintering or melting of raw dolomite.

O. P. R. O.

63. Durability of refractories. W. J. Rees. *Colliery Guardian*, **125**, 515.—R. brings out the foll. points: The importance of refrac. materials in present-day civilization is now accepted. Much less than a generation ago it could be said that the tech. study of the use of refrac. in this country was on a much lower plane than in Ger., but during the last 10 yrs. the leeway has been made up. Refrac. is now a final subject for degrees at the Univ. of Sheffield and manufacturers are stressing the need for research. The life of a fur. or fur. lining should not be measured in days, wks., or mos., or even in heats; the factor to ascertain, and the only sound basis on which to make comparisons, is the cost of refractories per T. (or other unit) of salable product. "Failure" might be loosely defined in terms of a life much shorter than the average, or in terms of a much higher cost in refractories per unit of satisfactory product. An analysis of "failures" which had come under the author's notice enabled the placing of them into four classes: (*a*) Unsatisfactory quality, including lack of uniformity of quality. (*b*) Faulty selection owing to the absence of knowledge of the conditions to be met. (*c*) Faulty treatment of the material in service, due either to accident, carelessness, or ignorance. (*d*) Failure to allow a margin so that abnormal conditions of short duration may be withstood, *i. e.*, "factor of safety." Failures of the first 2 classes should be entirely eliminated, and of the third, could be also to a marked extent, by educ. of charge hands. The standard methods of testing proposed by the refractories section of the Ceram. Soc. are well

known and widely used but the provisions of other tests which give measurable results and the amplification of some of the existing tests is desirable. The available methods to det. the resistance of refrac. to abrasion and slag attack are as yet purely comparative. It can be roughly detd. by drilling a hole in the brick, filling it with the slag or ash and heating under pre-detd. conditions. The brick is then cut or broken across the hole and the extent of corrosion or depth of penetration observed. A better method is to cement to the face of the brick a clay ring and fill this with the slag or ash as the face or skin of the brick is not then removed and its lower porosity may retard the speed of corrosion. Results of comparative tests of several brick are then given in detail. When the brick are being used for the building of coke ovens, if the coals, which are being coked are non-salty, satisfactory durability is obtained from either fire clay or semi-silica brick, but there is definite evidence from Amer. practice, that a silica brick oven construction renders possible the use of higher coking temps. and a larger output from an oven of given size without any sacrifice of by-products. Even the highest grade of fire clay brick will deform under load at a temp. well below its normal softening point, while a highly converted silica brick of low porosity will carry load almost up to its fusion point. At high coking temps. therefore the durability of adequately made silica brick will exceed that of brick made wholly, or in part, of fire clay. O. P. R. O.

64. Molding sands. W. J. Rees. *Metal Indus.*, **22**, 197(1923).—The principal points considered in the investigation of molding sands to make possible specifications or standards so that systematic definite lab. tests would det. the suitability of sands for various classes of work were: The chem. and mineralogical compn.; the texture or mech. compn.; the bonding power or strength; the permeability and porosity; the refractoriness; the durability. The ultimate analysis of a sample of the sand was the first consideration, the ordinary methods of silicate analysis should be used (Standard Methods of Testing, *Trans. Ceram. Soc.*, **19**19). A sample of sand was ground to an impalpable powder in an agate mortar, and then one g. was weighed into a platinum basin; 15 to 20 cc. of hydrofluoric acid and 3 cc. of strong sulphuric acid were added and the mixt. gently stirred with a platinum wire. Gentle evapn. to dryness on a sand bath till all evoln. of fumes had ceased then eliminated the whole of the free and combined silica as silicon fluoride, leaving all the bases as sulphates. This residue of sulphates was weighed, and approx. $^1/_3$ of this wt. represented the wt. of basic oxides present in the sand. The limits in chem. compn. would depend on the purpose for which the sand was intended. Many of the properties of a molding sand depended more on its mineralogical compn. than on its ultimate analysis. The water holding capacity was dependent on the propn. of colloidal matter present. A distinguishing feature of molding sands was their capacity for holding water without becoming really wet. The texture or mech. compn. or grading of the sand was detd. by sieving and elutriation methods. In the sand grade, the silt grade and the clay grade, it was in the clay grade that the bonding power was concd. The coarser grades were pure quartzose sand, while the other minerals were all concd. in the finer grades, the finest or clay grade having the compn. of a ferruginous clay. Prof. Boswell's method for detg. the transverse test and his method for measuring the permeability is also given; variations of from 50 to 500 sec. were obtained in this test, depending on the grading of the sand and the propn. of clay or other fine bond present. The ingenious method of measuring permeability devised at the Canadian Mines Branch is described, which eliminates some of the possibilities of error of the air method. The refractoriness of the sand might be detd. by the ordinary standard method, in which a small cone of sand was heated in an ordinary atm. along with standard cones. The durability of a sand was an impt. factor in its economic use, this could be tested under actual working conditions. Synthetic molding sands used in Gr. Brit. and Amer. were discussed. Rees believed that it would

be possible to make a synthetic sand which would give results in the steel foundry quite equal to those obtained with imported molding sands. Synthetic molding sand was prepd. from a high silica sand with the addn. of some material which would give it the necessary bond. The subject needed further investigation to perfect the synthetic sand, which when accomplished would make standardization possible, and variations practically eliminated. The question of the use of synthetic sand and the possibility of the use in them not only of clay, but also of starch, flour, and many of the carbohydrates required extended study. Rees mentioned the addn. of an exceedingly small propn. of alkali to the clay which had the effect of deflocculating it. Crushing the quartz grains should be avoided, and he thought that this deflocculating action pointed the way to a method of adequately mixing sands and clays. O. P. R. O.

65. Slag action on refractory linings. H. Hirsch. *Tonind. Ztg.*, **47**, 152–4(1923).—The influence of 9 different slags on different refrac. were studied. It was found that the porosity of the brick is more impt. than the Al_2O_3 content and the softening point. Brick made of fused clay (containing 70% Al_2O_3) were practically unaffected by slag action. Refractoriness is not important as long as the brick withstands the temp. at which they are used. Brick to resist slag should have a softening point above cone 28, compress. strength above 80 kg./cm.^{2}, the shrink. upon reheating to cone 14 should be less than 2% and should be dense and non-porous. H. G. S.

PATENTS

66. Refractory material for furnaces. C. A. Scharschu. U. S. 1,444,527, Feb. 6. A refractory compn. is formed in part of a coherent mixt. of crystd. MgO, calcined MgO of lower d. and C and in part of a subvitreous monolithic layer of MgO particles bound together by sublimed MgO. This layer has a mass d. of 3.5–3.6 and is so hard that it has a metallic ring even at elec. furnace temps. and it undergoes no material expansion or contraction at temps. up to 1800°. (*C. A.*)

67. Bonding carbide grains with ceramic material. M. F. Beecher and M. C. Booze. U. S. 1,444,162, Feb. 6. Grains of Si carbide or similar material are mixed with a ceramic binder such as a plastic clay compn. and the mixt. is fired in the presence of reducing gases or other medium which will prevent oxidation. (*C. A.*)

68. Electric furnaces. W. E. Moore. Can. 226,309, Nov. 21, 1922. In the manuf. of steel or other metals in an elec. furnace current is supplied to the bath from a plurality of arcing electrodes and the amt. of current passing through the bath is varied by varying the length of one or more of the arcs with respect to the others. The melt may be produced by means of a high voltage and long arc and refined with substantially the same current with reduced voltage and shorter arc. (*C. A.*)

69. Electric furnaces. W. E. Moore. Can. 226,310, Nov. 21, 1922. In the treatment of steel or other metals in an elec. furnace supplied with power from a multiphase circuit, a circulation of the bath is produced by a rectified current from the current of sep. phases. Two or more currents of different phases may pass from the electrodes to the bath and the amt. of current passing through the bath may be varied by unbalancing the resistance of the arcing circuits. (*C. A.*)

70. Electric metallurgical furnaces. W. E. Moore. Can. 226,311, Nov. 21, 1922. The furnace has a chamber adapted to contain metal, an elec. arc in the upper part of the chamber for heating the metal, a pair of extensions on the furnace bottom angularly disposed with respect to each other and to the central axis of the furnace. Each extension has a channel in the form of a loop of elongated transverse section which gradually expands upwardly into communication with the main chamber and an elec. heating element around which each extension is looped. (*C. A.*)

71. Electric furnace. F. T. Snyder. Can. 226,318, Nov. 21, 1922. A furnace

having refractory heat insulating walls and an arc resistor with a negative temp. coeff. is started with a long arc at high voltage and small current and the heat is furnished with a short arc at low voltage and high current. (*C. A.*)

72. Electric furnaces. I. RENNERFELT. Can. 226,027, Nov. 14, 1922. The furnace has a plurality of electrodes suspended into a projection from the bottom of the furnace under the electrodes, a conducting layer of C on the projection forming contacts for the ores formed, and a channel along the heating zone of the arcs for receiving the material to be heated. (*C. A.*)

73. Electric reverberatory furnace adapted for smelting ores. R. M. KEENEY. U. S. 1,438,381, Dec. 12. (*C. A.*)

74. Induction furnaces. J. R. WYATT. Can. 226,811, Dec. 5, 1922. The furnace has a pool for molten metal, walls forming a closed channel below the pool, the channel communicating with the pool at two points and having parts of the channel forming an acute angle at a distance from the pool and a transformer for which the metal in the channel acts as secondary, setting up motor effect in the channel. Cf. *Ceram. Abs.*, **1** [11], 279(1923). (*C. A.*)

75. Refractory ceramic ware. J. A. JEFFERY. U. S. 1,438,599, Dec. 12. A refractory material adapted for furnace linings or saggers is formed from a raw batch comprising a granular refractory material such as Si carbide and Edgar's plastic kaolin or a clay of like character. (*C. A.*)

76. Bonded alumina refractory material. M. F. BEECHER. U. S. 1,439,286, Dec. 19. Cryst. Al_2O_3 grains contg. slag and oxidation impurities are integrally united by a vitrified ball clay material so that the grains are substantially in contact and shrinkage of the article during firing is minimized. Articles such as fire bricks may be thus formed and are fired above cone 12 until any permanent vol. change due to expansion of the material has been completed. (*C. A.*)

77. Refractory materials. E. D. FROHMAN. Brit. 186,968, June 10, 1921. A refractory compn. consists of finely divided fire clay, a siliceous refractory substance such as ganister or asbestos, and a vegetable substance which acquires binding properties when moistened with H_2O, such as sulfite pitch (a by-product from the manuf. of sulfide pulp), dextrin, or gum arabic. The compn. is mixed with H_2O when required for use. (*C. A.*)

78. Tilting oil-fired crucible furnace adapted for melting metals. J. A. GASKILL. U. S. 1,439,409, Dec. 19. (*C. A.*)

79. Material for furnace walls. J. H. GRAY. U. S. 1,439,410, Dec. 19. Bricks for furnace walls are formed mainly of a carbonaceous material such as calcined anthracite mixt. with a facing layer of another refractory material more resistant to oxidation, *e. g.*, MgO, clay and SiO_2, Cr ore or zirconia. (*C. A.*)

PATENTS

80. Refractory materials. Z. OLSSON. U. S. 1,442,413, Jan. 16. A refractory material adapted for crucibles or furnace linings is prepd. from bauxite 95 and bentonite 5%. (*C. A.*)

81. Refractory articles containing zircon. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,440,766, Jan. 2. Muffles, crucibles or similar refractory articles are formed of zircon and carborundum. (*C. A.*)

82. Refractory articles containing zircon. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,440,657, Jan. 2. Retorts, muffles or other refractory articles are formed of zircon and SiO_2 or clay. Cf. *Ceram. Abs.*, **1** [3], 68(1922). (*C. A.*)

83. Refractory material for high-temperature apparatus. H. B. CLAPP. U. S. 1,437,584, Dec. 5. A mixt. of chromite 85 and ferro-Si 5 parts reduced to small particles

and associated with a binder, *e. g.*, Na silicate soln. 10 parts, is used for making linings of portable *gas producers* or other articles exposed to high temps. (*C. A.*)

Whiteware

84. The crazing of English earthenware. H. Elwood. *Pottery Gaz.*, **48**, 104–6 (1923).—The author considers bulk of crazing of earthenware bodies due entirely to variations in *body* compn. 80 bodies were made and dipped in a standard glaze. All bodies were glost fired at cone 01, and the biscuit firing was varied as follows: cones 04, 01, 2–3, 3–4, and 8–9. For this work the glaze used had the compn.:

$$\left.\begin{matrix}0.070\ K_2O\\0.233\ Na_2O\\0.400\ CaO\\0.290\ PbO\end{matrix}\right\}\quad 0.251\ Al_2O_3\quad\left\{\begin{matrix}3.164\ SiO_2\\0.402\ B_2O_3\end{matrix}\right.$$

The author concluded the best compn. for a safe body for practical working was 75.24 SiO_2; 20.59 Al_2O_3; in the fired condition, 4.18 bases. Before firing the composition was 71.10 SiO_2; 19.50 Al_2O_3; 3.97 bases 5.42 loss on ignition. Body was safe in firing range from cone 01 to cone 9, and porosity varying from 27.63 to 2.25%. It met with requirements of practical potting, as regards plasticity and safety during firing up to, say, cone 6, which was the limit required in hardest earthenware fire. The recipe for body is 40 clay; 50 flint; and 10 feldspar. Using a normal variety of flint and a mixed Cornish stone in place of the feldspar the batch is thus: 26 ball clay; 22 china clay; 19 stone; and 33 flint. However, the author pointed out that alteration of compn. of only one material in the mixt. may cause trouble. This was demonstrated by making up an earthenware body of definite compn., but using 64 different varieties of china clay. Fired at ordinary earthenware biscuit and glost temp. he obtained both crazing and peeling. J. W. H.

85. The atmospheric conditions in potters' shops and the efficiency of various types of drying stoves. H. M. Vernon. *Pottery Gaz.*, **47**, 1825–7(1922).—Av. temp. of potters' shops is about 67–70°F in winter and 75–82°F in summer as compared with usual workshop which is maintained at 60–65°F in winter. However, relative humidity, because of drying moist clay, is not high for the reason that the high temp. permits carrying more moisture without becoming half saturated. Author concludes, from evidence obtained, that potters are correct in maintaining high temps. are requisite for drying moderately sized articles and molds. It is obvious, however, a certain amt. of ventilation is necessary. The drying stoves investigated had enough leakages to insure fair ventilation. Attempts should be made to convey heated air to atm. but such installations require an independent heating system in the shop. J. W. H.

86. Chemical porcelain. G. White. *Pottery Gaz.*, **47**, 566–7(1922).—Hypothesis regarding the fracturing of chem. porcelain is given. Chem. porcelain being a supercooled liquid; the author advances the theory that fracturing is result of devitrification or an attempt at crystn. under *stress*. The requirements for production of chem. porcelain (1) body mixt. should be of such nature to be capable of as complete devitrification as possible, (2) adequate process of devitrification should be applied. In Worcester mixes max. crystn. occurred in a burning of 84 hrs. of which 30 hrs. consisted in heating from 1300 to 1400°C. In this period max. production of sillimanite occurred, advancing devitrification to a limit at which liability to further crystn. was sufficiently removed to make a high grade chem. porcelain. A method for measuring degree of crystallinity and ht. change resistance is needed badly to attack the problem adequately. J. W. H.

87. Pyrometers as applied to pottery industry. C. E. Foster. *Pottery Gaz.*, **48**, 441, 443, 445–6(1923).—A lengthy and general address bearing upon diff. types

of pyrometers, development of thermo-elec. pyrometer, base and noble metal thermocouples, functions of the protection tube or sheath, location of thermocouples and Seger cones. J. W. H.

88. Porcelain manufacture in Indo-China. Anon. *Brit. Clayworker*, **31**, 371.—The beginning of national porcelain industry at Tonkin is announced. It is due to the initiative of an Annamite who recently studied the industry in France and now employs at the Hap Loy works some 350 men. Indo-China itself promises to be the principal sales outlet. The local Gov't is supporting the venture by giving the firm an order for electric insulators required by the Post Office. Molds for the manuf. of European table and toilet services are on their way out, and the owner intends to adopt Japanese and Chinese styles for wares intended for the Annamite population. O. P. R. O.

89. Scientific aspects of China's ancient pottery industry. G. Wang. *Science* (China), **6**, 869–82(1921).—The manuf. of glazed ware in China dates from about the year 100 B. C. The excellence of the early pottery ware was due to the use by the Chinese of a feldspar glaze and high temps. Cu, Fe and Pb colors were largely used. There is no evidence of the use of Cr or U compounds. A type of furnace built on the principle of the Hoffman Ring furnace has been in use for at least 1000 years.

W. H. A. (*C. A.*)

PATENTS

90. Fused ceramic bearing. T. G. McDougal and S. J. McDowell. U. S. 1,438,188, Dec. 12. Annular bearings for speedometers or other instruments are formed of a fused ceramic material prepd. from a mixt. of feldspar and clay. (*C. A.*)

91. Crucible of chemical porcelain. H. D. Lillibridge. U. S. 1,441,690, Jan. 9. The pat. relates to the curvature of the wall of the crucible, which flares outwardly at its top. (*C. A.*)

92. Ceramic electric insulating material. J. A. Jeffery. U. S. 1,438,598, Dec. 12. Cf. *Ceram. Abs.*, **1** [8], 211(1922). Ceramic insulating material is formed from a raw batch composed of a calcined mixt. of clay, alumina and talc or feldspar mixed with raw clay. The clay of the calcine is selected so that it matures at the temp. of the formation of sillimanite and the raw clay is of such a nature that when heated by itself it matures at the temp. at which the ceramic mixt. matures. (*C. A.*)

93. Electrically heated ceramic ware. A. Steinhardt. Brit. 188,050, July 28, 1921. In the construction of an electrically heated ceramic vessel, the vessel after being fired is fitted with a heating resistance provided with terminals, the heating body being then covered with ceramic material having the same coeff. of expansion as the resistance and composed of the same materials as the vessel but with the addn. of fluxing materials which lower its sintering temp. below that of the heating resistance, after which the entire app. is again fired. The vessel is essentially made from kaolin, feldspar and quartz and the fluxes added to form the material may consist of the oxides of Mg, Na, Pb and B together with a little Na chloride and waterglass. For a vessel composed of clay 48, quartz 40, feldspar 12%, and provided with a heating body of nichrome the material may have the following compn. by wt.: Na_2O 0.1, K_2O 0.3, MgO 0.4, CaO 0.2, Al_2O_3 0.4, SiO_2 2.6 parts, and 4 parts of the material used in making the vessel. Such a compn. may be obtained by using borax 120, MgO 50, chalk 40, sand 70, Na_2CO_3 20, feldspar 100, PbO 40, zettlitz kaolin 100, fluorspar 60, Na_2SiO_3 50 parts, and 150 parts of glaze appropriate to the porcelain mixt. The terminals are in a holder and are preferably arranged side by side at 90° to the handle. In a modification the vessel has a raised bottom with a spiral groove on the underside in which the heating wire is situated. (*C. A.*)

94. "Safety-tread" ceramic tile. G. N. Jeppson and M. F. Beecher. U. S. 1,445,083, Feb. 13. Vitrified tiles of ceramic material are formed with cryst. granules

of Al_2O_3 or other abrasive material integrally embedded within the superficial or tread portion of the tile. (*C. A.*)

Equipment and Apparatus

95. The "Dorr" mill. A. S. W. Odelberg. *Pottery Gaz.*, **47**, 1671, 1673, 1675 (1922).—Description of a continuous grinding system at Gustafsberg for grinding a mixt. of equal parts of calcined quartz and flint. Capacity at present operation 7.2 T. per 24 hrs. or 11 lb. per min. dry wt. Thickness of pulp is 1.6 sp. gr. or 32 oz. per pint. Pebbles were worn away at the rate of 300 lb. per 24 hrs. Mill run at 35 r. p. m. Output of one unit of continuous system is equal to 5 times the output per unit compared with batch grinding. J. W. H.

96. A new viscosimeter for very viscous substances. R. Fischer. *Seife*, **45**, 483–4(1922); *Chimie et industrie*, **9**, 89(1923).—A jacket in which water circulates at 62° surrounds a tube contg. the sample, the temp. of which remains const. at 58°. The time required for an Al ball to fall the length of the tube is noted with a stop watch. Pure glycerol is taken as standard, and the viscosity is expressed as the ratio of the time of fall with the sample to that with glycerol. With dark or opaque liquids the Al ball is made to close an elec. circuit and light a lamp. A. P.-C. (*C. A.*)

97. Elastic column dynamometer for hardness testing. H. A. Holz. *Chem. Met. Eng.*, **28**, 269–70(1923). Illus. E. J. C. (*C. A.*)

98. Some notes on the evolution of the konimeter. R. A. H. Flugge-de Smidt. *J. Chem. Met. Mining Soc. S. Africa*, **23**, 77–86(1922). E. J. C. (*C. A.*)

99. New calculation for the determination of the strength of flanges. Oswald Klinck. *Chem. App.*, **10**, 3–4(1923).—Mathematical formulas. J. H. M. (*C. A.*)

100. Personal equation errors in optical pyrometry. Georg Keinath. *Stahl u. Eisen*, **43**, 9–12(1923).—Comparable temp. measurements by unskilled operators using the total, and the partial radiation, and disappearing filament optical pyrometers from 600° to 1500° show the disappearing filament optical pyrometer to be most serviceable. Facilities in operation permit a rapid proficiency and an accuracy of ±20° from 600–700°, ±15° at 100° and ±10° at 1500°. Above 1500° the radiation pyrometer is used. W. A. M. (*C. A.*)

PATENTS

101. Tubular resistance electric furnace. G. M. Little. U. S. 1,443,581, Jan. 30. A furnace adapted for baking green resistance rods is formed of tube sections (of graphite or other resistance material) held together end to end under pressure and surrounded by heat-retaining material, *e. g.*, lampblack and asbestos. (*C. A.*)

102. Electric resistance crucible furnace. C. H. Carpenter. U. S. 1,444,948, Feb. 13. Cf. *Ceram. Abs.*, **1** [9], 234(1922). (*C. A.*)

103. Tilting electric arc crucible furnace for smelting silver ore. R. M. Keeney. U. S. 1,443,024, Jan. 23. (*C. A.*)

104. Tilting electric furnace adapted for melting scrap iron. D. DeLuca. U. S. 1,442,925, Jan. 20. (*C. A.*)

105. Electric inductive furnace. G. H. Clamer and J. R. Wyatt. U. S. 1,444,584, Feb. 6. The furnace has a resistor dome and is adapted for melting metals. (*C. A.*)

106. Electric arc furnace. F. A. J. FitzGerald. U. S. 1,443,816, Jan. 20. The pat. relates to the manner of mounting opposed horizontal electrodes which are adjustable and extend through the side walls of the furnace. The furnace is adapted for use on single-phase current. Cf. *C. A.*, **17**, 371. (*C. A.*)

107. Electric arc furnace of the rocking type. W. E. Moore, H. F. Alter, E. A.

Hantf, J. R. Eckley and F. Wright. U. S. 1,444,980, Feb. 13. The furnace is adapted for melting steel. (*C. A.*)

108. Rotating or oscillating electric furnace plants. A. H. Peerson. Can. 228,203, Jan. 23, 1923. (*C. A.*)

109. Electric furnace. R. A. Driscoll. Can. 228,167, Jan. 23, 1923. An elec. furnace has a rotatably mounted inclined tube connected with an outlet in the furnace roof, means for rotating the tube, means for introducing charge materials into the upper end of the tube and auxiliary means for feeding material into the furnace. (*C. A.*)

110. Electric furnaces. F. W. Sperr and H. J. Rose. Can. 227,463, Dec. 26, 1922. An elec. furnace for testing materials consists of a row of heating units forming a long narrow chamber to receive a testing tube and means for connecting the units in circuit progressively from one end to the other so as progressively to heat the sample of material being tested. The units are U-shaped, of refractory material wound with resistance wire. (*C. A.*)

111. Electric resistance furnaces. T. A. Reid. U. S. 1,444,939–40, Feb. 13. (*C. A.*)

112. Electric resistance furnace. T. A. Reid. U. S. 1,443,590, Jan. 30. Heating units within refractory walls include plates which are brought into operative position by a lateral and tilting movement. (*C. A.*)

113. Electric resistance furnace. G. M. Little. U. S. 1,443,580, Jan. 30. The pat. relates to the manner of mounting and cooling the electrodes. The furnace is adapted for heating metals. Cf. *Ceram. Abs.*, **1** [6], 163(1922). (*C. A.*)

114. Apparatus for testing abrasives. L. Ratner and M. Schwarz. U. S. 1,444,803, Feb. 13. (*C. A.*)

115. Scleroscope. G. Wirrer and A. C. Moyer. U. S. 1,444,228, Feb. 6. The app. comprises a hammer moving in an open-ended tube with a cylinder and manually operated piston mounted on its upper end for actuating release mechanism for the hammer. (*C. A.*)

116. Scleroscope. R. Herrmann. U. S. 1,444,606, Feb. 6. The device comprises a gravity-actuated hammer mounted with a driver device to return the hammer to its starting position. U. S. 1,444,607 relates to a similar app. adapted for testing the hardness of metals. (*C. A.*)

117. Apparatus for analyzing flue gases. R. F. MacMichael. U. S. 1,443,492, Jan. 30. Flue gas and air are drawn by sep. suction fans through humidifying and temp.-controlling app. and the amt. of CO_2 in the flue gas is indicated by a recording drift gage depending on the differential pressures of the gas and air. (*C. A.*)

118. Apparatus for drying materials by steam and air currents. H. Bentz. U. S. 1,436,142, Nov. 21. (*C. A.*)

119. Pyrometer of the potentiometer type. H. J. Blakeslee. U. S. 1,441,207, Jan. 9. (*C. A.*)

120. Ball testing apparatus for estimation of resiliency of metals, rubber or other materials. R. M. Gaston. U. S. 1,441,626, Jan. 9. A steel ball is held by a magnet and released from a definite height and allowed to fall upon the material under test and the rebound of the ball is noted. (*C. A.*)

Kilns, Furnaces, Fuels and Combustion

121. John Wright tunnel oven. Anon. *Pottery Gaz.*, **47**, 1538(1922).—Installation at British Pottery Co., Tunstall. Built on the car tunnel kiln principles; that is, stationary fires and moving ware. Kiln is over 200 ft. long, internal width is about 5 ft. and height from truck platform to crown of arch about 6 ft. Capacity of each truck,

about 50 saggers. Charging schedule is one car per hr. An elec. motor penetrates charging ram, the actual charging time is 1 min. Firing zone operates at 1200°C. Gas is supplied by a Horsehay producer and arrangements made for burning off tarry matter which may be deposited in the flues. Primary air is heated in brickwork, and secondary air is drawn through cooling zone. This air cools the ware in the saggers and in consequence is heated. Waste ht. is used for drying purposes in manuf. process. An inspection pit runs the entire length of tunnel under the trucks. Coal consumption is about 300 lb. per hr. Photographs accompany article. J. W. H.

122. The "Potter" kiln. ANON. *Pottery Gaz.*, **47**, 1535(1922).—Description and phot. of gas fired continuous kiln erected by Dean, Hetherington & Co. at Alexandra Works of Domestic Porcelain Co., Fenton. Kiln consists of 10 chambers in a double row of 8 with a gangway between. Kiln is fired with a No. 4*a* Duff producer, with gas and air ports in central opening between the 2 rows of chambers. This opening is fitted with shelves to dry saggers from the green state by means of waste ht. from various chambers as they are fired. All chambers are connected to a stack 135 ft. high. Gas and air ports are underground. Saving of fuel claimed as 50% and labor as 25%. Quality of fired ware up to standard. Highest sagger is not more than 12 ft. above level of chamber. J. W. H.

123. Electric resistance furnaces. C. R. DARLING. *Electrician*, **90**, 168(1923).—Advantages of elec. heating *vs.* gas heating are enumerated. Ni-Cr alloys, in the shape of wire and ribbon, are widely used. They can be operated at 1000° for long periods of time without deterioration. For high speed steel treatment a resistor alloy that will operate at 1300° to 1400° is needed. D. believes that "a cheap alloy capable of withstanding 1800° without oxidizing" could be made. C. G. F. (*C. A.*)

PATENTS

124. Muffle furnace. A. McD. DUCKHAM. U. S. 1,436,582, Nov. 21. An annular muffle furnace is built with a traveling platform to which material may be supplied and from which the residue of the material may be removed without interrupting the operation of the furnace. (*C. A.*)

125. Rotary horizontal furnace or kiln adapted for heating granular or pulverulent material. A. DWORZAK. U. S. 1,443,529, Jan. 30. The kiln is surrounded by concentric chambers for hot gases and cooling water. (*C. A.*)

Geology

126. Feldspar. ANON. *Can. Min. Jour.*, **44**, 237(1923).—Potash feldspar (orthoclase and microcline) which occurs in abundance in several parts of Canada, contains in its pure state 18.4% alumina and 16.9% potash, with a combined potential value slightly below that of the same constituents in alunite. Should an economical process for resolving potash feldspar into its constituent parts be found, the comparative accessibility of Canadian feldspar deposits will put them in position for manuf. Large deposits of anorthite (lime feldspar) which contain in the pure state 36.7% alumina, the remainder being silica and lime, are also available in Canada. It is possible that some simple process may be found whereby this alumina may be made commercially available. O. P. R. O.

127. Note on the formation of the Alsatian potash basin. RAOUL LEBRUN. *Bull. Soc. ind. Mulhouse*, **88**, 508–11(1922).—The basin consists essentially of 2 potash layers which are worked and between which are: an unworked deposit of high-grade K salt 0.80 m. thick, a layer of almost pure K salt 0.30 m. thick and 1.80 m. above the first and lying between 2 layers of shale, layers of shale and salt of varying thicknesses, a 10-m. layer of rock salt just below the upper of the two worked deposits, and above and

below the potash layers are alternating layers of rock salt and of shale. From a detailed examn. of the fissures in the shales, L. concludes that the K deposits were not formed in a continuous manner but are the result of the leaching of considerable dry marine deposits, the waters having flowed to what is now the Alsatian basin, where they were evapd. A. P.-C. (*C. A.*)

128. Report of the work of the ceramic division. Joseph Keele. Can. Dept. Mines, *Summary Report*, No. **574**, 55–71(1922).—The Canadian deposits of brick, fire, pottery and special clays are described. L. W. R. (*C. A.*)

Chemistry and Physics

129. Action of heat on kaolins, clays. Anon. *Jour. Soc. Chem. Indus.*, **42**, 184A.—Samples of kaolins, clays, bauxites, infusorial silicates, etc., have been submitted to heating under varying conditions over a wide temp. range. The results show that plastic ceram. materials under the action of heat, undergo first a hardening without dehydration or change in vol.; this hardening is due to the partial peptising of the colloids which they contain. After dehydration and above 700°C phys. changes occur accompanied by shrinking, and the substances continue to harden, and at the same time the colloids disappear. Non-plastic ceramic materials only harden once, at about 1000°C, after their complete dehydration has occurred at 650–700°C. The phenomenon of peptisation of colloids plays a considerable part in the ceram. indus. and particularly in the industries based on baked earths. (*Comptes rend.*, **176**, 91–3(1923).)

O. P. R. O.

130. Coal. A. C. Fieldner, *et al.* *Proc. Am. Soc. Testing Materials*, **22**, I, 459–62(1922).—Report of Comm. D-5. The micropyrometer method for coal ash fusibility (*C. A.*, **16**, 3381) was compared with the standard gas-furnace method (*C. A.*, **14**, 1028). The 2 methods checked fairly well on most coal ash fusing below 2600°F by the gas furnace method, but very refractory ash, fusing above 2600°F by the same method, gave much lower results by the micropyrometer method. Tentative revision was made of standard methods of lab. sampling and analysis of coal (D22-21), and of the tentative method of test for fusibility of coal ash (D22-19T). J. L. W. (*C. A.*)

131. The density of a mixture of oxygen, carbon monoxide and carbon dioxide. Relations between the volume per cent and weight per cent. Paul Schreiber. *Z. angew. Chem.*, **35**, 701–2(1922).—Calcns. are made from the laws of dil. gases. The results are plotted in graphical form, convenient for fuel engineers. H. C. P. (*C. A.*)

132. Technical electroösmosis. P. H. Prausnitz. *Kolloid-Z.*, **31**, 319–23 (1922).—Electroösmosis has been industrially used in the purification and partial dehydration of clays, peat, etc. Glue, gelatin, glycerol, nitrocellulose, beet sugar solns., serums and tanning solns. have been purified. The methods for *clay* purification are given in some detail. Clay in colloidal suspension may be pptd. in dense form by d. c. Emulsions may be broken down. Cf. *Ceram. Abs.*, **1** [8], 198(1922).

J. O. H. (*C. A.*)

PATENTS

133. Isolation of alumina from clay. Hiroshi Tanaka and the Tokyo Kôgyô Shikenjo. Japan. 40,177, Oct. 3, 1921. Powdered clay is burned to a porous mass, mixed with concd. H_2SO_3 at low temp. and the mixt. is heated in a Pb-lined autoclave with agitation. When the reaction is completed the mixt. is cooled and filtered in the absence of air. The filtrate is heated at 100° in the absence of air to decompose $Al_2(SO_3)_3$ into Al_2O_3 and SO_2. A product of high purity is obtained. (*C. A.*)

134. Treatment of clay. W. Feldenheimer and W. W. Plowman. Brit. 186,855, Nov. 21, 1921. Addn. to 184,271 (*C. A.*, **17**, 194). The process described in the prin-

cipal pat. is modified by using as a deflocculating agent a dil. aq. soln. contg. the pyrophosphate of an alkali base, *e. g.*, Na pyrophosphate. The clay may be subsequently recovered from its suspension by the process of flocculation described in 121,191 (*C. A.*, **13**, 647) or otherwise. Cf. *Ceram. Abs.*, **2** [3], 51(1923). (*C. A.*)

General

135. The swelling of sand upon absorption of moisture and its effect upon batch mixing. L. E. Norton. *Pottery Gaz.*, **47**, 1371–2(1922).—2% addn. of H_2O caused an expansion in the vol. of sand of no less than 12.4% and in some cases the max. increase in vol. was reached when but 1% of H_2O was added. Hence measurement of sand by vol. cannot be considered trustworthy if a batch mixt. of accuracy is desired. In the discussion several took issue with reported increase in volume of sand upon the addn. of such small percentage of water. J. W. H.

136. Manganese dioxide produced by chemical process in California. George J. Young. *Eng. Mining Jour.*, **114**, 880(1922).—Finely ground ore is digested with sulphurous acid and air. Soln. is treated with calcium nitrate. Copper originally in ore ppt. by Al. $CaSO_3$ sepd. from soln. by evapn. and filtering. Manganese nitrate dissoc. by heat: HNO_3 and MnO_2 separately recovered. The dioxide is high grade and especially adapted to demands of chem. and glass manuf. S. L. G.

137. Barytes, occurrence, mining, uses. Raymond B. Ladoo. *Eng. Mining Jour.*, **115**, 319–24(1923). S. L. G.

138. Forms of specifications for purchasing coal. Hubb Bell. *Proc. Am. Soc. Testing Materials*, **22**, Part II, 567–79(1922). J. L. W. (*C. A.*)

139. Rational basis for coal-purchase specifications. E. B. Ricketts. *Proc. Am. Soc. Testing Materials*, **22**, Part II, 557–66(1922).—An explanation of some of the points necessary to be considered in adopting a satisfactory specification.
J. L. W. (*C. A.*)

140. Gas producers and producer gas. Victor Windett. *Blast Furnace Steel Plant*, **11**, 55–60(1923).—A discussion of what constitutes correct practice.
J. L. W. (*C. A.*)

141. The determination of volatile matter in fuels. P. Wedgwood and H. J. Hodsman. *J. Soc. Chem. Ind.*, **41**, 372–4T(1922).—Monel metal and calorized steel crucibles were studied as substitutes for Pt in the Am. Chem. Soc. method for volatile matter. The dimensions were those of the Pt crucible. The results are consistent, but about 0.5% lower than with Pt, owing to oxidation of the crucible, less loss by entrainment, and the fact that 3 min. instead of 1 min. are required to reach 930°. Monel metal is the better; it was still good after 50 detns. E. W. T. (*C. A.*)

142. Clay in 1921. Jefferson Middleton. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Pt. II, 105–10(preprint No. 18, publ. Sept. 20, 1922).
E. J. C. (*C. A.*)

PATENTS

143. Vertical gas retort and producers. J. W. Drake. U. S. 1,444,498, Feb. 6. Two gas producers adjoin a vertical retort and a passage leads from each of the producers to a chamber common to and intervening between the retort and the producers. Another passage leads from the chamber mentioned to a chamber surrounding the vertical retort. A duplex valve is mounted between each of the producers and the chamber first mentioned. (*C. A.*)

144. Automatic governor for gas producers. G. R. McDermott. U. S. 1,444,383, Feb. 6. A blast-blower of a gas producer is steam-driven and the supply of steam for

driving the blower is automatically controlled by back pressure to maintain a uniform flow of air. (*C. A.*)

145. Apparatus for scrubbing coal gas. A. F. Meston. U. S. 1,444,627, Feb. 6. The gas to be treated is passed in succession through an absorption chamber, a spray chamber and an elec. precipitator, arranged one above another. (*C. A.*)

146. Fire-resisting composition. C. E. Welles. U. S. 1,436,618, Nov. 21. A fire-resisting mixt. adapted for addn. to ordinary paints is formed of ZnO 1–2 lbs., air-slaked lime 1–2 lbs., linseed oil 1 qt., H_2O 1 pint, kerosene 1 pint, "sol. glass" (30–35° Bé.) 2–4 oz. and molasses 1–2 oz. (*C. A.*)

BOOK

A Bibliography of Colloid Chemistry Harry N. Holmes. The National Research Council has recently issued a Colloid Bibliography in mimeographed form, by Dr. Harry N. Holmes of Oberlin College, Chairman of the National Research Council Committee on the Chemistry of Colloids, a book of 135 pages containing 1800 references on 106 topics. All the references are classified and many are accompanied by brief comment. This book may be purchased from the Washington office at $1.00.

CERAMIC ABSTRACTS

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Vol. 2 | July, 1923 | No. 7

Author Index[1] to Abstracts for July

Author	Number of abstract
Akatsuka, M.	4, 82
Amsler, W. O.	39
Anfindsen, C. B.	68
Anon.	8, 9, 25, 28, 29, 32, 57, 63, 71, 102, 103, 104, 105, 111, 112, 113
Bell, H. A.	87
Benfey, G.	62
Berninghaus, E.	20
Black, J. H.	69
Bonnet, F.	85
Boswell, P. G. H.	106
Brit. Port. Cement Research Assn.	10
Brooks, F. W.	93
Budnikov, P. P.	1
Burns, R. M. and Hulett, G. A.	73
Caffrey, J. H.	18
Clark, W. M.	36
Collins, E. F.	33
Collins, H. F.	107
Corning Glass Works	55
Couëtoux, H.	92
Crowley, J. P. and Rowley, C. A.	47
Daae, R.	99
Delorme, F.	91
Deputy, H. S.	49
Derby, I. H. and Higburg, W.	100
Denlin, F. E.	48
Drouot, H.	72
Dümmler, K.	89
Durante, G.	86
Dyer, R. J.	96
Ferngren, E. T. and Soubier, L. D.	38
Flint, F. C.	27
Fowle, A. E.	50
French, J. W.	31
Fuha, K.	23
General Electric Co.	54
Gianoli, G.	34
Gillett, H. W. and Mack, E. L.	74
Green, M. M.	109
Gregg, A. W.	88
Haas, B.	14
Hansen, O. I.	108
Hattori, T.	5, 6
Heath, F.	65
Henshaw, S. B.	51
Hermant, G.	58
Holladay, L. L.	35
Jacobs, W. J.	43
Kasugai, I.	84
Kimura, S.	7
Kraus, L. P., Jr.	77
Kucera, P.	40, 42
Leissler, D.	21
Luce, G. E.	98
Marlow, J. H.	97
Metallisator, Ges.	116
Moats, T. B.	101
Moore, B. and Mellor, J. W.	2
Murrill, P. I.	117
Nacken, R.	13
Nakamura, H., Nakamura, K., and Kaisha, H. R. K.	78
Naske, C.	19
Nord, N. A.	67
Oki, S.	17
P. C.	59
Parr, P. H.	114
Pelc, J.	16
Poetschke, P.	12
Rev. Mat. Constr. Trav. Pub.	59
Rhead, F. A.	3
Rowley, C. A. and Reece, J. A.	37
Rule, J. F.	41
Saito, Y.	95
Sato, T.	94
Saxe, C. W.	76
Saxton, C.	26
Schrero, M.	118
Searle, A. B.	80
Seaton, M. Y.	11
Sharp, C. L.	53
Shigemune, R.	81
Soubier, L. D.	44
Staff article	64
Stark, J.	110
Sullivan, E. C. and Taylor, W. C.	45
Tadokoro, Y.	70
Takahashi, S.	24
Taylor, M. A.	90

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Author Index to Abstracts for July (*Continued*)

Author	Number of abstract	Author	Number of abstract
Taylor, W. C.	46	Uyeda, J.	83
Tefft, C. F.	60, 61		
Testrup, N.	115	Wagner, W. F.	66
Thatcher, H. S.	15	Whittemore, J.	52
Thomson, E.	30	Wood, R. F.	75
Tumura, G.	79		
Turner, W. E. S.	22	Yoshioka, T.	56

Art

1. Zircon for white glazes. P. P. Budnikov. *Tonind. Ztg.*, **47**, 173–4(1923).—Sn for the production of opaque glazes is becoming too expensive and difficult to get. Antimony (Sb_4O_6) produces opaque glazes with good color and gloss. Arsenic (As_2O_3) produces beautiful transparent white glazes and also opaque white glazes but they are not very durable and are destroyed by firing at high temps. A glaze contg. bone ash develops a scum on the surface. The best products are produced with cryolite. In order to get a better bond between the glaze and body small amts. of zinc oxide (ZnO), lime (CaO), etc., are added. The glazes produced with zircon compds. are much more dependable. 5% of the oxide of zircon (ZrO_2) gives a thorough white opaque glaze. Still better results are obtained with a mixt. of tin oxide (SnO_2) and a zircon prepn. By the introduction of ZrO_2 in the glaze the m.p. is raised. It was found that when the Sn and Zr are introduced as hydroxides they have a better covering power. This is due to the fact that the hydroxides are finer grained. The following glazes were used by B.:

Glaze 1		Glaze 2	
Oxide of zircon	5	Oxide of tin	7
Red lead	24	Oxide of zircon	3
Kaolin	10	Red lead	32
Soda ash	14	Silica	35
Calcium carbonate	1	Kaolin	10
Zinc oxide	1	Soda ash	12
Silica	35	Zinc oxide	1

H. G. S.

2. Note Books of Josiah Wedgewood. Bernard Moore and J. W. Mellor. *Pottery Gaz.*, **48**, 619–26(1923).—Quotations from original manuscripts of Josiah Wedgewood are given and they show that many ideas considered modern were worked out carefully as far back as 150 yrs. ago. J. W. H.

3. The romance of pottery. F. A. Rhead. *Pottery Gaz.*, **48**, 626(1923).—An address. J. W. H.

4. Uranium glazes. Mikiya Akatsuka. *Rept. of the Pottery Lab.* (Kioto), **1**, 57–73(1922).—*1. Vermilion glaze.* Raw glaze (b) composed of 35 white lead, 10 quartz and 8 ammonium uranate, $(NH_4)_2U_2O_7$, has produced a brilliant vermilion at cone 012a–011a. An addn. of Funori glue is recommended. It was applied 3 times as thick as ordinary porcelain glazes on vitrified porcelain biscuits. *2. Red glaze.* Replacing 1 part of the uranate with 1 part of ferric oxide in the glaze (b), a brownish red was obtained. *3. Crystal and luster.* The appearance of the glaze (b) changes with firing temp., thus:

Cone	012a	01a	1a	1a–2a	5a	8–9
Fuel	wood	coal	wood	coal	coal	coal

Color of glaze	vermilion	reddish orange	blackish brown	reddish brown blackish brown or reddish orange	yellowish green vermilion or blackish red	blackish brown
Color of crystal	.....	....	gold	crimson or green	green	....
Color of luster	.....	....	....	.....	greenish purple	gold or purple

4. Crystal glazes. The following table shows glaze batches and temperatures at which crystal glazes were developed:

Glazes	P	Q_1	Q_2	R	S
White lead	70	75	75	70	70
Ammonium uranate	16	15	15	15	16
Quartz	20	19	16	18	20
Rutil	7	7	8	3	..
Cobalt carbonate	..	0.5	1	..	0.5
Zinc oxide	..	..	..	5	..
Cone	5a,6a	5a	5a,6a	5a,8	1a

When a flower vase was glazed with R, set in a sagger which was coated with a glaze composed of 37 white lead, 8 quartz and 11 ammonium uranate, and burned to cone 5a, very fine golden small crystals were developed on bright glaze of same color.

S. Kondo

Cement, Lime and Plaster

5. Reagents used in etching cement clinker for the examination of its microstructure. The microscopic study of cement clinker. III. Takehiro Hattori. *Rept. Indus. Dept. Central Research Lab.* (Govt. of Formosa), **1**, 1–6(1922).—Thin sections of clinker can not be easily prepd., owing to its porous and friable nature. Therefore, a method which consists in polishing a single surface of the specimen, developing the structure by etching with a suitable reagent, and examg. under vertical illumination is usually used. Water and dilute soln. of HCl in alcohol have been recommended as the reagents. The author has tried other reagents for the purpose. Generally speaking, the sections of Port. cement clinker consist of cryst. grains (alite) and filling substances. The filling substances do not react uniformly with etching agents. Some portions of the filling substances in polished but unetched sections look gray under vertical illumination and are easily etched, while other portions are white and resist reagents better than the former. Eutectic structure is frequently observed in the filling substances. There are also grains which resemble alite but show different resistance to reagents. White substance was not attacked by water even when the section was immersed for 24 hrs. in it. Soln. of cane sugar retards the setting of the cement when its concn. is weaker than 0.5%, while it accelerates the setting when its concn. is stronger than 1%. When sections were treated with the 0.2% soln. for 5 min. the eutectic structure in the gray substance was distinctly developed as white spots. When sections were treated with the 10% soln. for 5 min. grains resembling the cryst. ones appeared. The author considers them as free lime. In conclusion, the author recommends the use of am. oxalate or am. sulphate for examg. distribution of alite crystals and the use of calcium chloride or cane sugar for the observations of gray substance. S. Kondo

6. Effect of aeration on the properties of Portland cement. Takehiro Hattori.

Rept. Indus. Dept. Central Research Lab. (Govt. of Formosa), **1**, 7–24(1922).—Influence of aeration of 4 Port. cements on market upon their various properties are described. The aeration was effected by spreading the cement in a shallow box and turning it over once a day. *1. Loss on ignition.* Loss on ignition increases with the time of aeration. A cement has shown 0.64%, 1.72%, 3.90%, 5.74%, 8.23% and 10.74% ignition-loss at the end of 0, 1, 4, 8, 13 and 20 weeks, respectively. *2. Constancy of volume.* Linear expansion of test pieces made of a cement with Le Chatelier's mold was measured by immersing them immediately in water. The average increase in length after 24 hrs. was as follows:

Time of aeration	0	3 days	2 weeks	4 weeks	8 weeks	20 weeks
Expansion in mm.	0.7	0.3	0.6	0.3	0.1	0.1

3. Time of setting. Aeration first retards the setting, then accelerates it and a further aeration retards it again. *4. Strength.* In general, the strength of a cement is decreased by aeration. Besides, tables and curves showing heat evolved in setting are shown. The author discusses the influence of free lime on various properties of the cements. S. KONDO

7. Slag cement and dolomitic cement. SABURO KIMURA. *Central Research Lab.* (The South Manchurian R. R. Co.) *J. Jap. Cer. Assn.*, **364**, 595–608(1923).—*A. Slag cement.* Tensile strength of numerous mortars composed of granulated blast-fur. slag of the Anzan Iron works or the Honkeiko Iron Works, Portland or natural cement, slaked lime and sand have been studied. To cite some of the results on the Anzan slag which was ground to pass through a sieve with 2500 meshes per sq. cm. and contained 36.97 sol. silica, 1.08 insol. matter, 11.86 alumina, 0.40 ferric oxide, 44.83 lime, 2.52 magnesia, 0.66 sulphuric anhydride and 1.64 sulphur, we have:

Propn. in wt.				Tensile strength, kg./sq. cm.			
Slag	Port. cement	Sand	Seawater per cent	7 days	28 days	3 months	6 months
...	1.0	3.0	8.3	15.3	20.0	23.4	25.8
0.9	0.1	3.0	8.8	8.0	22.4	24.5	26.0
0.8	0.2	3.0	8.3	8.4	22.5	25.8	26.0

Slag accelerates setting of Port. cement, thus:

Propn. in wt.			Setting time, hour, min.		
Slag	Port. cement	Fresh water per cent	Temp. in °C	Initial set	Final set
...	1.0	25.0	20.5	6.04	9.52
0.7	0.3	43.0	20.5	1.12	6.03

B. Dolomitic cement. Tensile strength of dolomitic cements which were prepared by calcining four kinds of Manchurian dolomite for several hrs. at 600–700°C and then by grinding them to pass through a 900-mesh sieve was tested. The strength and hydraulicity increase with its content in sol. silica. Some of the results obtained with a dolomite contg. 19.14 sol. silica, 0.66 insol. matter, 1.10 alumina and ferric oxide, 27.74 lime, 22.41 magnesia and 28.34 loss on ignition are as follows:

Propn. in wt.					Tensile strength, kg./sq. cm.	
Calcined dolomite	Port. cement	Calcined pegmatite	Anzan slag	Sand	14 days	28 days
...	1.0	...	...	3.0	17.9	25.0
1.0	...	...	...	3.0	6.9	15.0
0.9	0.1	...	...	3.0	6.9	11.9
0.9	...	0.1	...	3.0	8.1	12.5
0.9	...	...	0.1	3.0	15.0	19.4

Thus, dolomitic cement with small addn. of blast-fur. slag is a good hydraulic cement and can be used as a substitute for white Port. cement, as it can be prepd. nearly pure-white. S. KONDO

8. Fast hardening cements. (Fused cements.) ANON. *Rev. Mat. Constr. Trav. Pub.*, **162**, 49–52(1923).—Fused cement is made from limestone and bauxite (silicate of alumina) by heating the mixt. in a fur. till liquefied, and running it out to cool and solidify. The mass is crushed and then ground very fine, analyzing in per cent, SiO_2 10, Al_2O_3 40, Fe_2O_3 7, CaO 43, as compared with Port. cement SiO_2 22–23, Al_2O_3 6–7, Fe_2O_3 2–3, CaO 57–66. Fused cement sets slowly but afterwards hardens rapidly, the setting beginning to take effect 3 hrs. after mixing, and complete in 4–8 hrs., behaving like Port. cement. The setting of fused cement alone is accompanied by a great evolution of heat. The rapid hardening is illustd. by the fact that in a mortar the fused cement gains its full strength in 18 hrs., whereas it takes a month for the Port. cement.

Tensile strength	Kgms. per sq. cm.				
	18 hr.	2 d.	7 d.	28 d.	3 m.
Pure cement	..	..	..	..	..
Fused cement	39	62	68	77	77
Portland cement	..	25	48	52	56
1:3 mortar	..	..	..	..	..
Fused cement	38	41	43	40	39
Portland cement	..	14	28	35	37

For concrete mixts. of 1 m.^{3} of gravel, $^1/_2$ m.^{3} of sand, and varying quantities of cement the compression strengths are:

Concrete made with	Hectopiezes[1]				
	24 hr.	48 hr.	7 d.	14 d.	28 d.
Fused cement 150 kgms.	77.2	71.2	73.5	..	..
Fused cement 200 kgms.	93.7	145.1	152	..	..
Fused cement 250 kgms.	214.5	194.6	191.1	..	..
Port. cement 250 kgms.	...	22.1	57.1	93.7	82.7

[1] The Hectopieze is the authorized unit of pressure, 1.02 kgms. per sq. cm.

Action of gypsum. The screened hardened cement when mixed with $^1/_2$ of its wt. of gypsum and moistened does not swell, whereas Port. cement treated in a similar manner decomposes and swells to many times its size. LOUIS NAVIAS

9. New facts about "ciment fondu." ANON. *Rock Products*, **26**, 29(1923).—A series of tests of this quick-setting cement, which is a French product, were conducted recently by the Boston Elevated Ry. Co., the results of which are tabulated below. 3 well-known brands of Amer. cement and the specifications of the A.S.T.M. for 1921, were used in the comparison with *"ciment fondu."* 3 different mixes of *"ciment fondu"* were used. Figs. were obtained on the amt. passing through a No. 200 sieve, the time of initial set and final set, the strength of the French cement after 24 hrs., the strength of all cements of the 1 to 3 mix after 7 and 28 days, and the results of a 5-hr. boiling test. Sep. tests were made of the one-to-two and one-to-one mixes of *ciment fondu.* From the results it will be noted that the French cement obtained a strength in 24 hrs. greater than any of the standard cements did in 7 days and that the 7 day test of the French cement is greater by 15% than the 28 day test of the others. On the 28 day

TABLE I

COMPARATIVE TESTS OF 1–3 MIXTURE

Make	Initial set	Final test	Per cent passing No. 200 sieve	24 hr. tensile	7-day tensile	28-day tensile
A.S.T.M.	0 .0 hr. 45 min.	10 hr. 0 min.	78	. . .	200	300
"A" Brand	2 hr. 40 min.	6 hr. 10 min.	85 .2	. . .	348	377
"B" Brand	2 hr. 50 min.	5 hr. 40 min.	85 .4	. . .	271	300
"C" Brand	3 hr. 20 min.	7 hr. 25 min.	85 .0	. . .	282	356
French	3 hr. 5 min.	6 hr. 20 min.	96 .4	376	423	. . .

COMPARATIVE STRENGTH OF DIFFERENT MAKES OF CIMENT FONDU

Mixture	24-hr test	7-day	28-day	Per cent of strength
1 cement 3 sand	376 lb.	423 lb.	407 lb.	4 .0
1 cement 2 sand	578 lb.	725 lb.	671 lb.	7 .25
1 cement 1 sand	685 lb.	1,112 lb.	1,178 lb.	3 .0

test it showed a slight loss in strength compared with that at 7 days. This cement, however, did not stand up well under the 5-hr. boiling test, as it cracked and scaled.

O. P. R. O.

10. Setting of Portland cement. BRIT. PORT. CEMENT RESEARCH ASSN. *Pamphlet,* 1(1922).—This pamphlet gives the results of investigations by the Brit. Portland Cement Assn. into the cause of changes in the setting time of Port. cement. The summary of results is as follows: *Storage of cement out of contact with air.* 6 diff. samples of commercial cements, and 1 sample of pure cement (prepd. from rotary clinker without any addn. of water, steam or gypsum) when kept in sealed bottles for 4 and 6 mos., retained their original character of setting time, were unaffected by fluctuations of temp., and were independent of light or darkness, or the presence or absence of added gypsum. Exposure of cements to gases: (*a*) Pure dry air, oxygen and ozone had no effect on the setting time. (*b*) Moist air, oxygen and ozone retarded the set of all cements. (*c*) Dry carbon dioxide accelerated the setting time. (*d*) Moist carbon dioxide accelerated the set enormously, the character of the cements being entirely changed. All the above results were independent of the presence or absence or added gypsum. (*e*) Ordinary unpurified air had an uncertain effect on setting-time. 3 cements were quickened to a more or less degree, 2 were hardly affected, and 1 was somewhat slowed. In each case the effect on setting-time could be traced to the relative percentages of carbon dioxide and water absorbed or lost. (*f*) Exposure of the same sample of cement first to moist air (free from carbon dioxide) and afterwards to carbon dioxide, resulted in the setting time being first retarded and then accelerated. *Effect of addition of salts.* (*a*) The carbonates of soda, potash and ammonia accelerated the setting-time, the first 2 very strongly. (*b*) Sulphates, in general, accelerated the set. Except gypsum and small propns. of plaster of Paris, very few sulphates had a retarding effect and these all contained water of crystn. (*c*) Chlorides also, as a rule, accelerated setting-time, but the effect was, generally speaking, not very pronounced. (*d*) Nitrates, generally, had no very definite effect. (*e*) The hydroxides employed, including slaked lime, all accelerated the set of cements to a greater or less degree. (*f*) Borax had a similar effect, especially the crystd. salt. *Effect of crystd. water in salts.* (*a*) Anhydrous sodium carbonate, whether dissolved in the gaging water, or ground with the cement beforehand, had a strong accelerating effect on setting-time. (*b*) Crystd. sodium carbonate, dissolved in the gaging water, had a similar action. (*c*) Crystd. sodium carbonate, ground with the cement 24 hrs. beforehand, had considerably less action in quickening the setting-

time. (*d*) Anhydrous sodium carbonate ground with the cement 5 to 9 weeks before testing, greatly accelerated the set. (*e*) Crystd. sodium carbonate, ground with the cement 5 to 9 weeks before gaging, but little affected the setting of the cement, its slow-setting character being retained. (*f*) Quick-setting (ignited) cement, in contact for 6 hrs. with crystd. sodium sulphate or crystd. magnesium nitrate under pressure, became very slow-setting. (*g*) Cement, already slow-setting, was less affected by crystd. water expelled by pressure, but nevertheless absorbed a propn. of the crystd. water and became slower. *Summary of conclusions.* (1) The setting time of cement does not change of itself, even after prolonged storage out of contact with air. There is, therefore, no apparent spontaneous alteration in chemical composition or physical structure. (2) The time of set of cement appears to depend upon the proportion of combined water present in hydrated calcium aluminate or silicate, which tends to form a protective sheath or coating round the particles of cement and resists or delays the penetration of water to the active core. The greater the quantity of water absorbed by, or combined with, the cement, the more impervious is the protective sheath or film and the slower is the time of set. On the other hand, the setting is accelerated by any influence which abstracts water from the cement, or which attacks and destroys or modifies the sheath of hydrated material, thereby enabling the gaging water to penetrate more quickly to the active core of the particle. (3) Changes of setting-time (as when cement is stored) are brought about only by outside influences—*e. g.*, carbon dioxide and water vapor or active salts, which abstract water from, or act upon the protective sheath of hydrous material coating the grains. (4) Cement is capable of abstracting water from salts containing water of crystn. with which it lies in contact for some weeks. Such abstracted water hydrates the cement particles and retards the time of set. (5) Cement, in contact with salts containing water of crystn. which have part of such water expelled by pressure will under these conditions combine with the expelled water and become slower-setting. (6) The setting-time of cement, resulting from the partial hydration of the particles, remains unchanged provided the material is not subjected to outside influences which affect the hydrous film coating the grains. (7) The reason for the acceleration or retardation of setting-time by sol. salts is not sufficiently clear to warrant a definite conclusion being drawn as to whether the action is catalytic or not. In some cases, chem. reaction undoubtedly occurs (*e. g.*, with ammonium salts, and ferric sulphate) and it is reasonable to surmise that the action in other cases is also chemical. It does not, however, appear that the alteration in setting time, brought about by the addn. of salts, is directly due to the formation of double salts, except perhaps when the double sulphate of lime and alumina is formed. In several instances the effect on setting-time appears to be clearly dependent upon the presence or absence of crystd. water in the salt used. (8) The results of this research lead to the conclusion that the use of gypsum as a retarder is sometimes uncertain and irregular in its effects. On the other hand, the regulation of setting-time by hydration, through the medium of steam or water appears to be more permanent. In practice, the regulation of setting time by hydration alone is not generally adopted by manufacturers and some further investigation as to the relative advantages of gypsum and water (or steam) as hydrating agents is desirable.

O. P. R. O.

11. Magnesium oxychloride cements. M. Y. Seaton. *Chem. Age* (N. Y.), **31**, 17–22(1923).—Mg oxychloride cement was originally made by Sorel in 1867. It is important as a binding material because it attains high strength at an early age even with free exposure to air. It does not exhibit a high vol. change due to temp. changes or other causes. The raw materials, mfg. process, selection of suitable aggregates, and the use of oxychloride cements are discussed. Cf. *Ceram. Abs.*, **1** [7], 192–3(1922).

J. C. W. (C. A.)

12. Physical properties of dental cements. II. Paul Poetschke. *Ind. Eng. Chem.*, **15**, 339–42(1923); cf. *C. A.*, **10**, 1226.—Methods and app. are described for detg. the heat generation, texture, permeability and setting time of Zn oxyphosphate cements. The heat generated in setting varies considerably in different brands. The heat can be varied greatly by the rate of addn. of powder to liquid and the time of mixing. By proper mixing no brand should cause damage. Crushing strength is directly proportional to heat generation, cements evolving the most heat having the highest crushing strength as well as the finest texture. The texture varies from fine vitreous to coarse chalky. The latter texture is the more permeable to aq. fluids. Cements of fine vitreous texture are impermeable to dye solns. Com. designations for hardness such as "slow," "rapid," etc., are of slight significance, for there is recognized no standard time of set. A cement setting at room temp. relatively faster than another may be relatively slower at body temp. Those showing the greatest strength, the finest texture, the least permeability and the greatest heat liberation on setting show the greatest increase in strength between the 15-min. and 24-hr. period of setting. The ideal cement should set slowly at room temp. and rapidly at body temp. C. C. D. (*C. A.*)

13. Thermochemical research on cement. R. Nacken. *Zement*, **11**, 245–7, 257–8(1922).—N. deals with the drying of cement in rotary driers at about 500°, the expulsion of CO_2 at 900°, incomplete burning between 1000 and 1250°, in which stage exothermic reactions occur, burning at 1250°, and finally strongly burning at 1400° or higher. The development of heat in the burning of cement is slow below the stage at which CO_2 is expelled. The heat of reaction begins to increase slowly at 930° and rises from 120 to 500 cals. per g., then more slowly to 600 cals. per g. The max. is at about 950°. As soon as the CO_2 is expelled, a vigorous reaction occurs, *i. e.*, the formation of Ca silicates and aluminates, this reaching a max. at 960°, after which equil. is very quickly reached. Different results obtained in tech. practice are due to heterogeneity of the raw materials and the fact that some Ca carbonate has escaped burning until the end. It is calcd. that the quantity of heat required to burn 1 kg. of clinker up to a temp. of 1400° is about 900 cals. J. S. C. I.

14. Improvements in the manufacture of magnesia cement. B. Haas. *Chem.-Ztg.*, **46**, 88–9(1922).—Crude $MgCl_2$ liquors contg. KCl, NaCl, and $MgSO_4$ so often used in making MgO-$MgCl_2$ cement make a product which dries more slowly, has less hardness, discolors more easily and requires more mechanical treatment but shows less blowing and sweating than one made from a pure $MgCl_2$ soln. of the same concn. Because of such properties and the greater cost of transport of liquor, the relative economy of the 2 methods must be calcd. for each case. Pure $MgCl_2$ solns. for a given purpose should be made 2–3° Bé. less concd. than the proper crude liquor. $MgSO_4$ is of advantage in preventing discoloration and blowing, particularly if weathering occurs under warm and dry conditions. Because of its cost, $MgSO_4$ can be replaced by by-product kieserite. This has proved so efficient that all $MgCl_2$ has been replaced by kieserite and the product is non-hygroscopic and free from blowing, though the rate of drying and hardening is slower and the strength and toughness are less. By replacing $MgCl_2$ by 15% more than its equiv. wt. of kieserite, a product is obtained with satisfactory tenacity. Replacement of part of the $MgCl_2$ by metallic salts, particularly Fe salts, gives a product with less blowing and sweating and with toughness, color and good hardening qualities. Fe salts can also be used advantageously with $MgSO_4$ or with kieserite to obtain pleasing colors. C. C. D. (*C. A.*)

PATENTS

15. Plaster or cement. H. S. Thatcher. Can. 228,860, Feb. 20, 1923. Finely divided kieselguhr is mixed with finely divided calcined gypsum. (*C. A.*)

16. Hardening plaster, mortar or cement containing lime. J. Pelc. U. S.

1,447,568, Mar. 6. A mixt. of NaH sulfate and CaF_2 is added to accelerate hardening. (*C. A.*)

17. Waterproofing reagent for concrete. SEI OKI. Japan. 40,198, Oct. 4, 1921. Pptd. residue obtained from soy-bean oil is partly sapond. and $BaCl_2$ soln., kieselguhr and $Al(OH)_3$ are added. The product is dild. with H_2O and used for mixing cement for concrete, etc. (*C. A.*)

18. Fibrous wall-board. J. H. CAFFREY. U. S. 1,447,708, Mar. 6. A mat of loose fibers is coated with a liquid cement, the fibers are sepd. in places to form openings and the material is then compacted under pressure. (*C. A.*)

BOOK

19. Die Portlandzementfabrikation. CARL NASKE. 4th Ed. revised. Leipzig Th. Thomas. 469 pp. (*C. A.*)

Enamel

PATENTS

20. Method of enameling. EUGENE BERNINGHAUS. U. S. 1,452,635. The method of producing enameled chair sections which comprises applying an annular coating of fused enamel to the exterior of an annular sheet metal chair section having inwardly turned opposite edges by rotating said section with its exterior surface including portions of said inwardly turned edges in contact with a bath of fused enamel.

21. Enameling oven. D. LEISSLER. U. S. 1,447,795, Mar. 6. The oven is adapted for baking glazed articles. (*C. A.*)

Glass

22. Heat resisting glasses. W. E. S. TURNER. *Pottery Gaz.*, **48**, 607–17(1923).—The tendency of glass to fracture was at first attributed to lower thermal cond. of glass, so that, on heating it, the slow flow of heat across its walls resulted in great tension on the colder layers not exposed to source of heat. But relative cond. for heat alone does not entirely account for the fracture. The term "thermal endurance" was introduced by Winkelmann and Schott to denote the power of a glass to withstand thermal shock, and the formula which was deduced to represent the relationship of thermal endurance, F, to other properties was $F = \frac{T}{E\alpha}\sqrt{\frac{K}{Dc}}$ where T is the tensile strength; E, Young's modulus of elasticity; α, the linear coefficient of thermal expansion; K, the conductivity for heat; D, the density; and c, the sp. ht. It can be noted that the properties which directly affect the thermal endurance are tensile strength, elasticity, and the coeff. of expansion, the remaining three factors producing an effect proportionate either directly or inversely to their square roots. Hence attempts to improve heat resisting power of glasses have been either in the increasing of mechanical strength or of diminishing the coefficient of expansion. SCHOTT was successful in making glass articles of which the inner part had a lower coeff. of expansion than the outer, and when the glass cooled, the inside layer was in compression. This type fell under increase of mechanical strength. Coeff. of expansion of glass is intimately connected with its compn. and it has been found possible to make glasses having linear thermal expansions varying bet. 30 and 130 $\times$ 10^{-7}. Schott showed that different constituent oxides had *each* a definite effect on the total expansion of the glass and in conjunction with Winkelmann, so-called "expansion factors" were detd. The expansions were found to be additive and permitted of calculation from the formula $3\alpha = p_1a + p_2b$. p_1, p_2 being the respective percentages and a,b being the expansion factors for the constituent oxides. The following expansion factors were calculated by Winkelmann and Schott:

B_2O_3	0.1	Li_2O	2.0
MgO	0.1	BaO	3.0
SiO_2	0.8	PbO	3.0
ZnO	1.8	CaO	5.0
P_2O_5	2.0	Al_2O_3	5.0
As_2O_5	2.0	K_2O	8.5
		Na_2O	10.0

The expansion factors represent the contribution which each 1% of the particular oxide made to the total cubical expansion of the glass. It has been found that some of Winkelmann and Schott's factors need revision, the effect of magnesia, for example, not being as advantageous as the earlier factor. It will be seen from the table of expansion factors that two oxides in particular, namely, silica and boric oxide are associated with small expansion. The following analyses of 6 types of heat resisting glasses will illustrate the extent to which the 2 oxides have been used in modern times:

	Kavalier's combustion tubing	Austrian "Sun brand" lamp glass	Jena Thermometer 591	Jena "Best" lamp glass	British miners lamp glass	Pyrex glass
SiO_2	79.57	76.78	71.95	73.88	64.1	80.62
B_2O_3	...	...	12.00	16.48	22.0	11.90
As_2O_5	...	...	...	0.73	trace	0.66
Sb_2O_5	...	...	...	...	1.1	...
Al_2O_3	0.32	0.72	5.0	2.24	1.9	2.00
Fe_2O_3	0.04	trace	...	trace	..	0.14
CaO	7.80	6.52	...	trace	0.5	0.22
MgO	0.11	0.24	...	trace	0.1	0.29
PbO	...	...	...	...	0.6	...
Na_2O	0.66	11.14	11.0	6.67	9.7	3.83
K_2O	11.60	4.74	...	trace	..	0.61
Coefficient of linear exp. A	69.8×10^{-7}	83.0×10^{-7}	64.5×10^{-7}	46.7×10^{-7}	56.3×10^{-7}	$37.2\times10^{-}$
Coefficient of linear exp. B	.....	.....	57.0×10^{-7}	.....	.....	$32.0\times10^{-}$

A. Calculated by Winkelmann and Schott's expansion factors.

B. Experimental 0° to 100°C.

Linear expansion (thermal) of ordinary soda lime glass about 100×10^{-7}.

Linear expansion (thermal) of ordinary potash lead glass about 90×10^{-7}.

The modern glass contains boric oxide in very considerable amount. Pyrex glass, the most notable of glasses in recent years, contains roughly 80% of silica and 12% of boric oxide. There is a tendency in the manuf. both of chem. and heat resisting glassware, to make them strongly acid in character, since the acid oxides, silica and boric oxide are far superior to the basic oxides in giving low expansion. So far as the use of other oxides is concerned, the field is not exhausted. Thus, zirconia has a linear expansion coeff. of 8.4×10^{-7}, only little inferior to fused silica, but with a melting point of about 2600°C, clearly this oxide is first likely to find use, not in the pure, fused state, but as an addition to silica and the same is true of other refractory oxides such as titania and thoria. Some preliminary attempts have been made to produce glasses by adding small amts. of titania and zirconia to silica, the objects being to increase the resistance of the fused silica to devitrification and to attack by basic materials. The general results stated to be achieved are the production of a glass having superior mechanical properties and thermal properties to vitreosil, although actual numerical data have not been quoted. At Sheffield it has been found possible to add both zirconia and titania to the

ordinary glasses and it is hoped that the announcement of the results will soon be forthcoming. It may be noted, however, that when several per cent of titania is present, small crucibles of glass can be cooled down without special precautions to yield unbroken lumps. This indicates either a reduced thermal expansion or an increased mechanical strength: in any case an improved heat resisting glass. In the presence of reducing gases titania glass tends to be dark brown in color, although it is possible to retard such color development. Progress in the endeavor to increase the mechanical strength of glass might first profitably be made in a systematic detn. or redetn. of the relationship between the tensile, compression and other mechanical properties and the chem. compn. The Jena workers have already drawn certain conclusions as to the effect of different constituent oxides and additive relationships established, but in the author's view, their results need revision. As to the possibility of heat treatment, it is to be remembered that until devitrification sets in, glass contains no crystalline structure, the units of which could have their boundaries modified, as is possible in metals by cold working or by heat treatment. Owing to its brittleness, glass hardened by quenching possesses an element of risk, as when the outer layers are broken through, the mass is at once reduced to powder. J. W. H.

23. Coloring glasses with cobalt compounds. KITSUZO FUHA. *J. Jap. Cer. Assn.*, **364,** 587–95(1923).—Coloring action of cobalt compds. on various glasses has been studied. Formula of basal glass was $R_2O.RO.3SiO_2$, $R_2O.RO.O.5B_2O_3.3SiO_2$, $1.3R_2O.RO.6SiO_2$ or $R_2O.B_2O_3.6SiO_2$, in which R_2O is Na_2O or K_2O and RO represents CaO, MgO, ZnO, BaO or PbO. Results: (1) Color produced by CoO is stable and accordingly is alike for almost all kinds of glass except pink shade in soda glasses which can be distinguished from potash glasses only when amount of the oxide is small (2) no diff. in coloring power was observable between cobalt carbonate and cobaltocobaltic oxide, Co_3O_4, obtained by igniting cobalt nitrate, if equivalent amounts were used (3) addn. of small amt. of alkali nitrate, potassium tartarate or arsenious acid to the batch had no influence on the coloring. Cf. *Ceram. Abs.*, **2** [3], 58(1923). S. KONDO

24. Temperature in pot furnaces. SANGORO TAKAHASHI (TOKIO ELECTRIC CO.). *J. Jap. Cer. Assn.*, **364,** 609–18(1923).—The author performed numerous expts. with two pot-furnaces having 10 or 16 covered pots and gives detailed descriptions or discussions on (1) calorific power of their coal (2) ht. required for melting their glass batch (3) compn. and calorific power of their producer gas (4) amt. of air required for the complete combustion of the producer gas (5) the theoretical combustion temp. (6) lowering of the temp. due to the heat absorption of the glass-batch and the conduction through furnace-walls (7) variation in the climate in Tokio (8) influence of climate on the draft of their stacks, (9) lowering of furnace-temp. due to wet coal, (10) measured temp. in their fur. and also (11) on the influence of season upon the cracking of glass pots. Heat utilized in melting batch was 8.6%, in a half-gas fired fur. "A" contg. 16300 kg.-pots, and 10.4%, in a Mond-gas fired fur. "B" contg. ten 250 kg.-pots, of that generated in each fur. by the combustion of the gases. Heat lost by conduction through fur. walls amounted to 15.9% in "A" and 19.0% in "B." The mean max. temp. observed close to pots was 1522°C in "A" and 1517° in "B." S. KONDO

25. Glass manufacture. ANON. *Raw Materials Rev.*, **2,** 154.—A part. of app. for molding glass is made from steel containing from 10 to 15% of chromium and from .5 to 5% of cobalt. Another suitable steel contains about 13% of chromium, about .5% of manganese, about .6% of cobalt and about .35% of carbon. Another steel contains chromium and about 4% of silicon. It is found that molds made from these steels have a longer life than molds made from cast iron, and that they are particularly suitable for use with a glass that requires to be worked at a high temp. O. P. R. O.

26. Glass forming machines. C. SAXTON. *Pottery Gaz.*, **48**, 629–34(1923).—A very complete description of the principles of various glass mfg. machines and the methods employed in the production of the various types of glass ware. J. W. H.

27. Feldspar for the glassmakers. F. C. FLINT. *Pottery Gaz.*, **48**, 670–71(1923).—See *Jour. Amer. Ceram. Soc.*, **6** [3], 413–6(1923). J. W. H.

28. Sanitary measures in milk industry safeguarded by constant watchfulness. Glass bottle and automatic machinery greatest factors; makes complete sterilization possible. ANON. *Glass Container*, **2** [7], 11, 12(1923).—Sterilization is observed by testing unfilled bottles many times a week in order to test the performance of each type of washing, rinsing and filling machine. Efforts to avoid contamination are practiced throughout the whole industry. W. M. C.

29. A study of the return and breakage problem of milk bottles. ANON. *Glass Container*, **2** [7], 1, 5, 6, 7, 46(1923).—Report of a survey by the Glass Container Association among the milk dealers in N. Y. City. It is estimated that 1,600,000 milk bottles are delivered in N. Y. each morning. The av. bottle makes 17 trips where formerly it made eleven. Improvement has come about as a result of checking up on delivery system and plant operations. Mechanical handling of milk bottles and the use of latest types of washing machines, conveyers, filling, sterilizing and capping machines have reduced breakage to less than 2%. Sterilizing is performed at 160°F, washing at 120°F, and rinsing at 100°F. Proper temp. regulation lessens breakage. W. M. C.

30. Fused quartz, silica glass or fused quartz. ELIHU THOMSON. *G. E. Rev.*, 68–74(1923).—Articles with illus. on the prepn., properties, and uses of quartz glass. W. M. C.

31. Abrasives and polishing powders for glass. J. W. FRENCH. *Trans. Faraday Soc.*, Oct.(1922).—The action of an abrasive is outlined briefly; rate of abrasion depends on size of grain, force of impact, number of impacts per unit time, and is propnl. to the load on the tool and also to relative speed of translation. Several typical abrasives are illustd. and their relative merits discussed, namely diamond splinters, carborundum, emery and rounded grains of sand. The action of polishing is discussed in detail. Polishing media, of which the best is ferric oxide or rouge, are referred to also. Innumerable scratches when a polished surface is etched is a series of minute percussion cracks which are quite invisible until the edges of the cracks have been opened by etching. The moment the etching vapor strikes the surface of the glass, the scratches flash instantly into view. Hitherto the assumption has been that a surface layer has been dissolved away, thus exhibiting underlying scratches. O. P. R. O.

32. The silvering of glass. ANON. *Optician*, **60**, 183(1920); *J. Soc. Glass Tech.*, **5**, 125.—Several methods are described. The first requires 4 solns. as follows: (1) 40 g. of crystd. $AgNO_3$ in one l. distd. water; (2) 6 g. of NH_4NO_2 in 100 g. of water; (3) 10 g. of KOH in 100 g. of water; (4) 25 g. of sugar in 250 g. of water; add 3 g. of tartaric acid, boil for ten min. and allow to cool, then add 50 cc. of alc. and dil. with water to 500 cc. All these solns. can be kept without undergoing alteration. Equal quantities of the 4 solns. are mixed and the glass is immersed in the mixt. with the side to be silvered facing downwards. The second method is a modification of Brashera's process. NH_3 is added to a 10% $AgNO_3$ soln. until the ppt. is re-dissolved; to the total vol. half as much of a soln. of KOH is added, and then more NH_3 until the mixt. is clear. A weak soln. of $AgNO_3$ is further added until a bright brown tint results. Silvering is carried out by using a mixt. of this and a sugar soln. contg. 10% of sugar, 10% of alc., and 0.5% of HNO_3. The side of the glass to be silvered should be on top. For another method, two solns. are used: (*a*) 8.5 g. of $AgNO_3$ in 200 g. of water; (*b*) 15 g. of Rochelle salt in 200 g. of water. NH_3 is added to the mixt. until the ppt. is almost re-dissolved and the soln.

filtered. Two solns. are also used in a fourth process: (1) sugar 20, HNO_3 4, alc. 175, water 1000 parts; (2) 15 cc. of a 1% $AgNO_3$ soln., 7.5 cc. of a 0.5% KOH soln., and 22 cc. of NH_3. NH_3 is added to the $AgNO_3$ soln. until the ppt. is re-dissolved then the KOH soln., and finally the rest of the NH_3. Soln. (1) improves with age; 170 cc. of it are added to soln. (2) as made. Looking-glasses can be silvered simply by employing a mixt. of a 1% $AgNO_3$ soln., which has been treated with NH_3 until the ppt. has nearly disappeared, and a 1% formalin soln. The surface to be silvered should be placed downwards. In all cases abs. cleanliness of the glass is essential and directions are given for ensuring this. H. G. (*C. A.*)

33. Notes on reheating of glass electrically. E. F. Collins. *Glass Ind.*, **3**, 223 (1922).—Glass is athermous to heat rays. At 100° 2.6 mm. of glass intercepts all heat radiations, and at 390° it intercepts all but 6%. The ratio of convected heat to radiated heat in the metallic resistor furnace varies from about 20% at 500°F to about 3% at 1600°F. Hence in the electric metallic resistor furnace the reheating of glass at temps. required for molding is secured almost entirely by radiant heat, and the temp. is under perfect control. J. B. P. (*C. A.*)

34. The heat balance of glass leers. G. Gianoli. *Ind. laterizi ed aff.*, **1**, 16–8 (1922); *Chimie et industrie*, **9**, 115(1923).—G. counts on the following losses: producing steam required by the gas producer 3–3.2%; in gas producer (unburnt fuel in ashes, soot radiation) 1.2–15%; cooling of the gases in the ducts 4–4.1%; regenerating chambers 6.1–6.7%; conduction and radiation from the leer 43–44.9%; flue gases 19%. There remains but 12.5–13.7% for the fusion of the glass. A. P.-C. (*C. A.*)

35. Resistivity of vitreous materials. L. L. Holladay. *J. Franklin Inst.*, **195**, 229–35(1923).—A study of the resistivity of hard, light flint, and lime glasses. J. S. H. (*C. A.*)

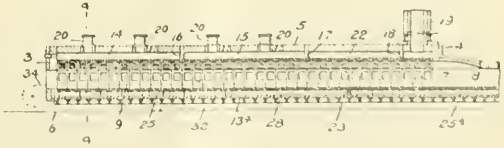
36. Opportunity for an American glass training school. Wm. M. Clark. *Glass Ind.*, **4**, 9(1923).—A discussion of the Glass Trade School in Zwiesel, Bavaria. Cf. *C. A.*, **5**, 1327. J. B. P. (*C. A.*)

PATENTS

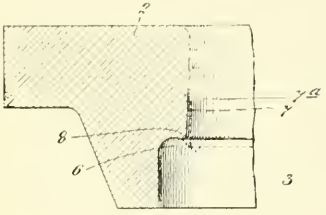
37. Apparatus for cutting sheet glass. Clifford A. Rowley and Joseph A. Reece. U. S. 1,453,856. In combination with a conveyor for carrying a sheet of glass longitudinally, an automatic apparatus for transversely cutting the glass sheet, comprising a cutting tool, a carrier for the tool, means for drawing the tool across the sheet, means for moving the carrier with the sheet while the cutter is operating, and means for returning the parts to the starting position.

38. Glass-cutting mechanism. Enoch T. Ferngren and Leonard D. Soubier. U. S. 1,453,315. The combination of a container for molten glass having an outlet orifice in the bottom thereof through which the glass issues, cutting mechanism comprising shear blades located beneath said orifice at opposite sides of the issuing glass, and means to advance said blades in spiral paths and thereby sever the issuing glass, said blades having V-shaped cutting edges, the outer portions of which overlap as the blades approach so that the cutting edges surround the issuing glass during the cutting operation.

39. Annealing furnace or leer. Walter O. Amsler. U. S. 1,453,116. In an annealing furnace or leer, an annealing chamber, a tunnel in communication with the annealing chamber, a chimney disposed between the annealing chamber and tunnel, and longitudinally extending heating flues disposed below the annealing chamber and extending beyond the chimney



and into the tunnel structure and exteriorly of the tunnel, said flues having connections with the chimney and arranged to produce a flow of gases from the tunnel back to the chimney. Cf. *Ceram. Abs.*, **2** [5], 96(1923).

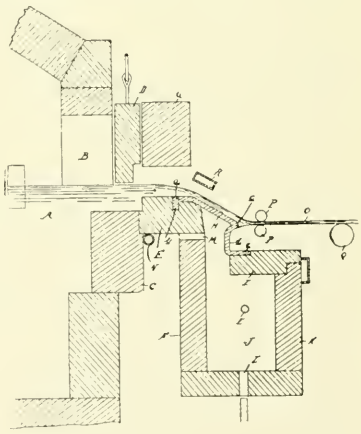


40. Method of manufacturing ring molds and the like. PETER KUCERA. U. S. 1,453,278. The method of manufacturing molds for pressed glassware which comprises producing a matrix of approximately the desired shape, then subjecting portions of the mold to compression forces to compact and harden the said portions, then finishing the hardened portions to the desired size and shape.

41. Apparatus for gathering and transferring molten glass. JOHN F. RULE. U. S. 1,453,285. Cf. *Ceram. Abs.*, **1** [11], 290(1922). The combination of a carrier rotatable continuously about a vertical axis, a gob forming receptacle carried thereby open at its lower end to receive a charge of glass, means to dip said receptacle into contact with a pool of molten glass during said rotation and gather a charge of glass by suction, a knife on said carrier, means to project the knife across the bottom of the receptacle to sever the gathered glass from the supply, a burner on said carrier, means to project the burner laterally to an operative position directly beneath the charge of glass and direct a heating flame vertically upward against the cut end of the glass, means to then withdraw the burner, and means to introduce the glass into a shaping mold.

42. Matrix device for molds. PETER KUCERA. U. S. 1,453,277. A block mold for the manufacture of glassware or the like comprising in combination a body portion provided with a mold recess, a mold table, a ring mold, a member mounted upon the side wall of the mold and being provided on one end with a configuration adapted to be impressed upon the article being molded and means operated by the ring mold to move said member into operative position and operated by the mold table to move said member out of engagement with the finished molded article.

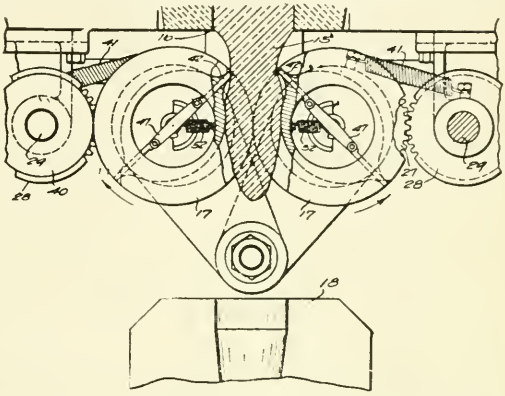
43. Apparatus for drawing sheet glass. WILLIAM J. JACOBS. U. S. 1,453,842. In a sheet glass drawing apparatus, the combination with a means for supplying molten glass continuously, of a metallic slab onto which the glass from the supply is adapted to flow in a continuous sheet, means for cooling the glass while on the slab, and means for stretching it from the edge of the slab into a sheet of predetermined thickness.



44. Method of and means for feeding molten glass. LEONARD D. SOUBIER. U. S. 1,453,290. The combination of a container for molten glass having an outlet at which a continuous supply of the glass is maintained and through which a column of glass is extruded, a pair of gob shaping rolls on opposite sides of the glass, means to rotate said rolls in contact with the extruded glass while the latter is still united with the glass in the container, and cutting mechanism arranged to advance with the shaping surfaces of the rolls and sever the glass into individual masses.

The combination of a gob forming roll having two oppositely disposed gob forming

recesses extending along its periphery, said roll having diametrically opposite slots between the ends of said recesses, cutter blades mounted to reciprocate radially in said slots, a yoke connecting said blades, means to rotate the roll, and a stationary cam arranged to shift said yoke in one direction when the roll reaches a predetermined point in its rotation to thereby project one cutter and to shift the yoke in a reverse direction when the roll has rotated a half revolution beyond said position, whereby each cutter is projected at the same rotative position. Cf. *Ceram. Abs.*, **2** [4], 74(1923).



45. Glass. E. C. Sullivan and W. C. Taylor. Can. 228,865, Feb. 20, 1923. A glass has a combined silica and alkali percentage compn. over 90 and a mol. ratio of alkali to silica between 26 and 29 to 100 and a mol. ratio of bivalent oxides to silica between 7 and 10 to 100. Cf *Ceram. Abs.*, **2** [3], 64(1923). (*C. A.*)

46. Glass. W. C. Taylor. Can. 228,866, Feb. 20, 1923. A glass with a low sp. gr. contains at least 3% B_2O_3 and a sulfate salt. Cf. *Ceram. Abs.*, **2** [6], 126(1923). (*C. A.*)

47. Apparatus for bending continuous-sheet glass. J. P. Crowley and C. A. Rowley. U. S. 1,447,647, Mar. 6. Cf. *Ceram. Abs.*, **1** [12], 332(1922). (*C. A.*)

48. Leer conveyer for continuous-sheet glass. F. E. Deulin. U. S. 1,447,648, Mar. 6. (*C. A.*)

49. Leer conveyer for continuous-sheet glass. H. S. Deputy. U. S. 1,447,649, Mar. 6. (*C. A.*)

50. Apparatus and method for drawing two sheets of glass in separable contact with each other. A. E. Fowle. U. S. 1,447,654, Mar. 6. (*C. A.*)

51. Apparatus and method for flattening sheet glass. S. B. Henshaw. U. S. 1,447,661, Mar. 6. (*C. A.*)

52. Drawing sheet glass. J. Whittemore. U. S. 1,447,702, Mar. 6. Mech. features. (*C. A.*)

53. Muffle leer furnace adapted for annealing glass. C. L. Sharp. U. S. 1,447,633, Mar. 6. (*C. A.*)

54. Glass. General Electric Co. Brit. 188,451, Sept. 14, 1921. Transparent SiO_2 glass is made by fusing SiO_2 in a vacuum and then compressing the fused mass while plastic to reduce enclosed bubbles. A suitable construction is specified. (*C. A.*)

55. Glass. Corning Glass Works. Brit. 189,126, Nov. 14, 1922. A part of an app. for molding glass is made from steel contg. Cr 10–15 and Co 0.5–5%. Another suitable steel contains approx. Cr 13, Mn 0.5, Co 0.6, and C 0.35%. Another steel contains Cr and about 4% of Si. Molds made from these steels have a longer life than molds made from cast Fe, and they are particularly suitable for use with a glass that requires to be worked at a high temp. (*C. A.*)

56. Glass. Tôsaku Yoshioka. Japan. 40,242, Oct. 6, 1921. When superheated steam is passed into a mixt. of silicates and NaCl heated below its m. p., the reaction

$2NaCl + SiO_2 + H_2O = Na_2SiO_3 + 2HCl$ takes place. The silicate is then melted with suitable materials for glass. *E. g.*, a mixt. of SiO_2 100, CaO 22 and NaCl 33 is heated at 700° in a rotating fur., into which superheated steam is then passed; a porous mass of silicate is smoothly produced. (*C. A.*)

Heavy Clay Products

57. Brick specifications. ANON. *Tonind. Ztg.*, **47**, 212(1923).—Building brick are burned brick made of loam, clay or clay like mass which may contain sand or grog. The test below shall be the average of at least 10 tests.

	Compression strength, kg./cm.²
Clinker brick	350
Hard burned brick	250
Common brick 1 grade	150
Common brick 2 grade	100

The brick should be 25 cm. long, 12 cm. wide and 6.5 cm. high. The per cent absorption should be less than 5% for clinker and less than 8% for hard burned brick. Clinker, hard burned brick and common brick used for building purposes should be sufficiently resistant to frost. In this test 10 bricks are saturated with water and frozen at −4°C 4 hrs. This is repeated 25 times. In the compression test none of the clinker brick shall have compression strength less than 300 kg./cm.² For hard burned brick none shall have a strength less than 200 kg./cm.² Common brick of 1st grade should have no brick having less than 120 kg./cm.² and those of the 2nd grade should have no brick having a greater strength than 90 kg./cm.² H. G. S.

58. The use of waste slate for brick making. G. HERMANT. *Rev. Mat. Constr. Trav. Pub.*, **162**, 60–2(1923).—Waste slate, ground to pass an 8 mm. screen, mixed with 5–8% slaked lime, and moistened with 8% water, was made into brick in a brick press. The brick were then hardened by exposing them for 8 hrs. to steam at 8 kgms. pressure. The crushing strength of the brick was 120 kgms. per sq. cm. Of a series of mixts., varying the size of particles, and the per cent of slaked lime used, the above mixt. gave the max. strength. The slate analyzed in %, SiO_2 57.2, Al_2O_3 26.0, CaO 3.30, MgO 3.00, ign. loss 3.10. L. N.

59. The treatment of calcareous clays. P. C. *Rev. Mat. Constr. Trav. Pub.*, **162**, 41B–43B(1923).—Review mainly of the work of BINNS, COATS, AND BLEININGER, and description of the Pratt machine for removing lime concretions from clay. L. N.

60. Equipment and methods used at Darlington Clay Products Co. (First Section.) C. FORREST TEFFT. *Brick and Clay Record*, **62**, 771–4(1923).—Description of brick machine, cutter, accounting for ware, drying, burning, fuel used, and fans. The plant is equipped with 8 round down-draft kilns with a total holding capacity of 580,000 brick. One of these kilns has just recently been built. The construction of this kiln is rather interesting as the kiln is carefully insulated throughout—in bottom, side walls and crown. The induced draft used in the kilns is furnished by two fans. One of these is located at the cold end or receiving end of the drier so that its suction draws the hot combustion gases from the kilns through brick flues and into cast-iron pipes located immediately underneath the drier tracks. The 2nd fan is located at the end of the main brick flue, which runs across the end of the drier and from which the first fan takes its hot gases for the drier. These two fans furnish the kilns with a constant, neverfailing draft *regardless of weather conditions.* The draft obtained is equivalent to a stack *300 ft. high heated all the time.* There is no difference with the draft system whether gas or coal for fuel is being used. The fan at the cold end of the drier is called the drier fan. It is a standard $5\frac{1}{2}'$ steel plate fan with $\frac{3}{4}$-steel housing, and is driven with a 20 h. p. motor

at 650 r. p. m. In reality only 18 h.p. is required to drive the fan. The temp. of the gases handled averages about 325°F and because of this the bearings on the fan are water cooled. The fact that the gases furnishing ht. for the driers are confined within pipes, is of course, positive protection against impurities coming in contact with the brick, as is the case with a waste heat drying system, where the gases from cooling kilns are traveling in the same chamber that contains the brick. This fact makes it necessary to bring in outside air into the drier to act as a carrying agent for the moist. coming from the brick. A steel housing fitted to the discharge end of the drier fan carries the hot gases to a 50 ft. stack immediately over the cold end of the drier. The stack being heated with these gases produces a suction or a draft at its base and, by means of opening dampers leading from the top of each tunnel an outlet is obtained for the moist. laden air from the brick. A 2nd fan called the kiln fan is located at the end of a large flue. The duty of this fan is to handle all the combustion gases that do not need to go through the drier. This is a number 12 multivane fan and actually requires between 15 and 20 h.p. to pull it. The fan runs at 450 r. p. m. and is equipped with water cooled bearings as the gases sometimes reach a temp. of 600°F. Plans are given of kiln bottom, drier and cross section of drier from end to end. This is to be supplemented by a 3rd section dealing with description of control equipment, method of setting, cooling, drawing, stocking, and details of the burners. J. W. H.

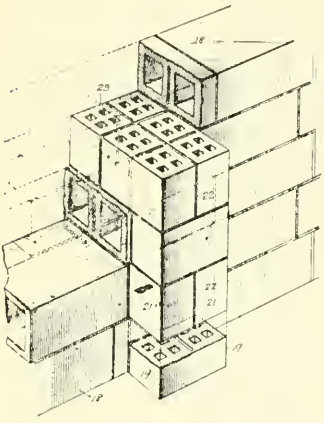
61. Equipment and methods used at Darlington Clay Products Co. C. Forrest Tefft. *Brick and Clay Record*, **62**, 681–4(1923).—Description, accompanied by photos and sketch of operns. used in the manuf. of bricks at Darlington, Pa. plant of Fiske and Co., Inc. Detailed information is given relative to mine, clay drilling, blasting, drainage, ventilation, roof supports, supervision, haulage, handling of clay, clay storage, grinding, screening, ground clay storage, and mixing of clay with manganese. This article to be followed with another section devoted to drying and burning problems. J. W. H.

62. Manufacture of clay products in Germany. Gustav Benfey. *Brick and Clay Record*, **62**, 602–3(1923).—One of a series of articles treating with the manuf. of clay products in Ger. Pick and shovel methods cannot be discarded in small pits where foreign materials such as lime, hard stones, etc., must be removed. Where such conditions do not exist a Liebscher dredger is used. This machine is of same general type as shale planer. Clay feeders of round and box type are used: the round feeder to feed material evenly while the box type feeder performs additional service of mixing clays with other ingredients. Sketches and photos of planer and feeders are given. J. W. H.

63. A new way to use the shale planer. Anon. *Brick and Clay Record*, **62**, 788–9 (1923).—A conveyor used in conjunction with shale planer permits working of face worthy of note. Photos and diagram are given. Advantages claimed are: (1) It keeps a smaller amt. of face open for wet and cold or exceedingly dry weather. (2) It increases the capacity of the machine over that which can be obtained with the same machine going straight into the bank for the tapering out from a full cut to no cut is almost instant on one end of the swing, while on the other it is the same as ordinarily experienced. This raises the efficiency of the Adel excavator working on a 25′ radius from 94% to slightly more than 96%. By this efficiency is meant that percentage of the cutting time at which the machine is cutting the full depth or full capacity. It should be clearly brought out that any machine which does not increase the radius of swing from one cut to the next will cut its full efficiency or capacity for one instant only and that is when the cut is directly ahead of the direction in which the machine is going. (3) The face of the bank which is left behind the planer and which in the ordinary plant will be cut over in about 60 d. is left circular so that it does not cave in or weather down easily. (4) The depth of the cut in the floor of the pit can be regulated so that

within two movements of the loading hopper, the machine can dig itself in easily 15 ft. if necessary. In starting in on a new cut this is sometimes quite an advantage. J. W. H.

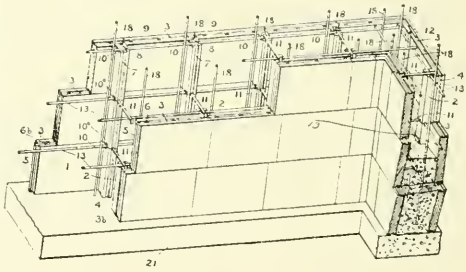
64. Automatic kiln firebox. STAFF ARTICLE. *Brick and Clay Record*, **62**, 614 (1923).—Description and sketch of system used by P. J. LAUBSCHER of Fredericksburg, O., used for feeding a small quantity of coal continuously. J. W. H.



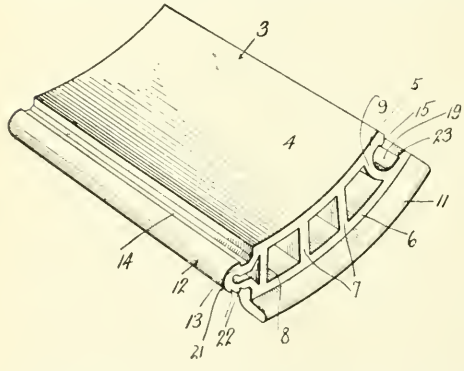
PATENTS

65. Pilaster construction. FREDERICK HEATH. U. S. 1,453,837. A pilaster construction, comprising wall blocks arranged in interbonding relation in superposed courses, the width of each pilaster block being slightly less than one-half its length, one of said courses including a pilaster block disposed parallel with and entirely outside of the wall face and the next superposed course including a pilaster block disposed at right angles to and overlapping said subjacent block and also overlapping a wall block within the wall body to securely bond the wall and pilaster together.

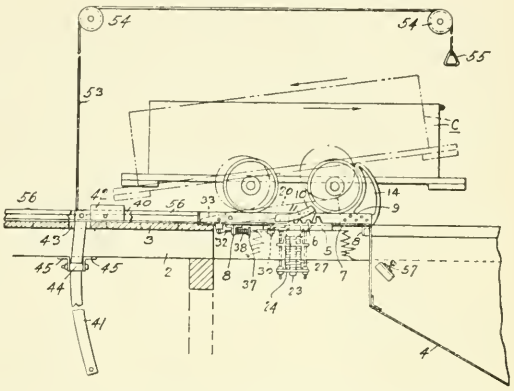
66. Masonry structure. WILLIAM F. WAGNER. U. S. 1,453,557. In a masonry structure, two series of blocks arranged apart so as to leave a space between them, the blocks of each series being provided with inner retaining supports and with sockets on their upper surfaces, in combination with aligning rods engaging the retaining supports and each spanning a number of said blocks, and transverse tie bars, each engaging the sockets of opposite blocks with its ends.



67. Building block. NELS A. NORD. U. S. 1,453,806. A building block comprising a body provided at one edge with a tongue portion which is curved along the plane of its axis beyond the adjacent edge face of the body, said tongue portion being provided at one side with a recess and at its opposite side with V-shaped grooves, the body of the block being provided at its opposite edge with a substantially U-shaped socket the mouth of which is of the same transverse breadth as the transverse breadth of the tongue portion at its base line, the intermediate portion of the socket being of greater transverse breadth than the intermediate and end portions of the tongue, the socket being of greater depth than the length of the tongue, the mouth portion of the socket being provided at one side with an inwardly disposed flange adapted to fit snugly in the recess upon the tongue of an adjacent block, the relative dimensions of the tongue portion and the socket being



such that when two of the blocks are placed edge to edge together the tongue portion of one block is completely received in the socket of the other block, with the face surfaces of the adjacent blocks in close contact with each other and sufficient space being left between one side of the tongue portion only and the adjacent surface of the socket to receive and completely enclose a filling of cement.



68. Kickback car dump. CHRISTIAN B. ANFINDSEN. U. S. 1,453,331. Cardumping apparatus of the kick-back type comprising a support, tracks carried by the said support, means for causing the said support to be tilted to cardumping position, auxiliary tracks also carried by the said support and means for resiliently maintaining the said auxiliary tracks inclined upwardly in the direction of movement of the cars coming upon the said support.

BOOK

69. Manual of Face Brick Construction. J. H. BLACK. Milwaukee, Wis.: C. N. Caspar. 116 pp. $9. (*C. A.*)

Refractories

70. On the thermal properties of refractories at high temperatures. YOSHIAKI TADOKORO. *Rept. of the Research Lab. of the Imperial Iron Works*, **2**, 41 pp.(1922).—*I. Refractory materials. II. Classification.* Raw materials, propns. and methods of mfg. various fire bricks at the brick plant of the Imp. Iron Works in Yawata are described. *III. Properties required in refractory materials* and their measurement at high temp. *IV. App. for measuring coeff. of exp. and its manipulation.* At one end of cylindrical test piece, 30 mm. in diam. and 180 mm. long, 4 small round holes, 5 mm. in diam., and 30, 80, 130 and 80 mm. deep, were bored symmetrically to its axis, and 3 quartz tubes and a thermo-element were inserted in them. The other end of the test piece was fixed by a quartz tube. It was heated in an elec. fur. with 2 platinum coils. Its expansion was calculated from the rotation of 3 mirrors attached to the ends of the quartz tubes. *V. Results of the expts.* (1) Linear change of raw silica brick in heating. (*A*) *First heating and cooling.* Exptg. with a dry raw silica brick, composed of 78.4% Tamba quartzite, 19.6% Usuki quartzite and 2.0% CaO, the following result was obtained: (*a*) The test piece expanded about 1.35%, when it was heated to 575° C. Then the expansion stopped abruptly owing to the transition of α quartz to β. (*b*) No change in length was observed up to 870° where a slight contraction, about 0.05%, corresponding to the transition of α tridymite to β_2, took place. (*c*) No remarkable change occurred between 870°–1130°; at the latter temp., sudden expansion occurred; it may owe to the acceleration of the transition of β quartz to β cristobalite at 1250° by the impurities. The expansion between 575° or 1130° and 1300°, amounting to 0.85% of original length, was irreversible. (*d*) Cooling curve shows no linear change between 1300–570°. It began to descend suddenly at 570°, leaving 0.98% expansion at ordinary temp. Besides, the heating and cooling curve shows some changes at 200–300°C.

(*B*) *Second heating and cooling.* The same test piece was heated once more to 1300° and cooled. The reversible parts of the curve were similar to the former. As for the irreversible change, it was slight and no permanent expansion was caused by the treatment. (*C*) *Third heating and cooling.* The inclination of the obtained curve was similar to that of the expt. *B*. (2) Heating and cooling curves of silica bricks. Burned bricks made of quartzite of Darien showed permissible permanent expansions only in 3rd or 4th heating to 1300°, while those made of red-and-white piebald quartzite, as used in the expt. 1, indicated no permanent expansion in the 1st treatment. (3) Irreversible expansion of a red quartzite. A red quartzite, contg. 94.26 SiO_2, 2.10 Al_2O_3, 1.40 Fe_2O_3 and 0.84 CaO, was heated at various temps. to find changes in wt. and permanent expansion. The result seems to comply with that of the expt. 1. (4) Coeff. of expansion of various bricks. The following table shows the coefficients of 5 kinds of bricks:

	Magnesia brick	Silica brick	Chrome brick	Grog brick	Red brick
Mean coeff. of expansion (20–1000°)	1.255×10^{-5}	1.142×10^{-5}	0.902×10^{-5}	0.760×10^{-5}	0.700×10^{-5}

Calculated expansions of a by-product coke oven and a blast fur., assuming their mean temp. as 1000°, agreed pretty well with facts. (5) Expansion curve of coal. Test piece made of 2 mm. grains of Futase coal and 10% water shrunk about 2.5% at 300–400°. (6) Expansion of slag brick and slag cement. 11 curves are given. (7) Expts. on Manchurian magnesites. Chem. compns. of the samples were as follows:

Color	SiO_2	Fe_2O_3	Al_2O_3	$CaCO_3$	$MgCO_3$
Blue	20.02	0.48	0.14	0.90	79.03
White	16.62	0.72	0.32	0.60	81.42

(*A*) *Dissociation at ordinary pressure.* The dissociation began at 400°, was most vigorous at 600° and was nearly completed at 800°. (*B*) *Irreversible changes in length, sp. gr. and wt.* Each test piece was a cylinder, 30 mm. in diam. and 30 mm. long, cut from one of the said ores, and was heated in an elec. carbon-resistance fur. for $^1/_2$, 1 or 2 hrs. at constant temp. White magnesite showed max. expansion of 0.6% at 600°, contracted to original length at 800° and shrunk 4% at 1400°. Blue sample expanded 0.2% at 600°, shrunk to original length at 800° and contracted 3% at 1300°. Abrupt contraction occurred at the last temp., indicating their incipient fusion at 1300° or 1400°C. The loss in wt. occurred almost entirely at 400–800°. Sp. gr. was 3.0 for 100–600°, 1.6 for 800–1400° (800–1300° for the blue magnesite) and 2.5 for 1400–1700°. (*C*) *Slaking test.* The results of slaking tests in atmosphere or boiling water indicated that the Manchurian magnesites must be burned at least to 1300° or 1400°. (*D*) *Expansion and contraction of magnesite at high temps.* The white magnesite expanded with temp. until 600° was reached where its expansion amounted to 1.4%. Beyond 600°, slight contraction began. It shrunk rapidly at 1100°C. The cooling curve is almost straight. *VI. Tech. position of refractories.* Short discussion is given on the subject. Cf. *Ceram. Abs.*, **1** [8], 208(1922). S. KONDO

71. A new commercial refractory. ANON. *Chem. Age* (London), **8**, 419.—Elec. sintered magnesite, a material having the highest m. p. of any commercial refractory is now being produced in quantity by the Carborundum Co., Niagara Falls, N. Y. It is made from carefully selected cal. magnesite and is thoroughly fused in an elec. fur. It contains about 95% MgO and less than 1% of iron oxide, and has a m. p. of about 2600°C. The material is especially resistant at high temp. to iron or iron oxide. This makes it most valuable for lining metallurgical fur., either in the form of bricks or in

granular form, tamped in. A further unusual feature of elec. sintered magnesite is that it does not contract when subjected to conditions encountered in industrial installations. O. P. R. O.

72. Refractory materials. H. Drouot. *La Tech. Moderne*, **15**, Jan.-Mar.(1923).—Les Materiaux Refractaires gives a comprehensive summary of refractive materials, including a history of the refractory industry; procedure in fabrication of refractory materials; general properties of refractories; their analyses, chemistry, metallurgy and fusion point, compn. of crucibles for fusion of metals; diagrams showing the high temp. to which refractories may be subjected, which temp. is the detg. factor of their industrial application. The article is well illustd. with cuts and descriptions of machinery used in the refractory industry, including gyratory crusher, mixing, kneading, briquetting and molding machines. Much remains to be done in this industry with regard to the quality as well as the price of products, and a no. of problems have been but indifferently solved in the chem. and metallurgical industries. It is hoped that the engineer of tomorrow will have at his disposal, for high temp. work, materials of low cost, with high resistance and not easily affected by quick changes of temp., chemically neutral, not easily attacked by gas and dust in suspension, and which have a sufficiently high point of softening to allow performing other contemplated reactions. O. P. R. O.

73. Some properties of graphite. R. M. Burns and G. A. Hulett. *J. Am. Chem. Soc.*, **45**, 572–8(1923).—The ds. of various graphites were detd. by the liquid immersion method. The d. of pure graphite is about 2.20, and that of Acheson graphite about 2.30. The d. of C produced by the explosion of graphitic acid indicates that it is probably graphite. Completion of the "drift" or increase in wt. during immersion in the liquid was hastened by pressure, and the tendency to drift was largely destroyed by compression by the detn. of d. H. J. C. (*C. A.*)

74. Electric brass furnace practice. H. W. Gillett and E. L. Mack. Bur. Mines, *Bull.* **202**, 319 pp.(1922); cf. *C. A.*, **14**, 1784, 2133, 2753, 3195.—A report too comprehensive to permit abstracting. Numerous tables, illustrations, and both subject and name indexes are included. The purpose of the report is to present available information on what com. elec. brass furnaces are doing and can do, and to show, by description and exptl. test data, the evolution of present furnace types, including information on failures as well as on successes. Fundamental principles of design, construction, and operation are also considered. After a discussion of theoretical and practical advantages of elec. brass melting, of the distinction between steel-melting and brass-melting elec. furnaces, and the classification of elec. brass furnaces, the individual furnaces are considered under the following classes: (*a*) crucible furnaces, either lift-out or tilting; (*b*) hearth furnaces heated by a resistor, a smothered arc, a direct arc, or an indirect arc, the last two types in both stationary and moving furnaces, or by induction in a horizontal ring, a vertical ring, or a high frequency furnace. In conclusion are considered the factors governing the choice of a particular furnace, the relation of the central station, the cost of power, methods of testing furnaces, and the conservation possible in metals, crucibles, labor and health, and fuels. L. J. (*C. A.*)

75. Smelting silica bricks with reverberatory slags in a copper blast furnace. R. F. Wood. *Eng. Mining J.-Press*, **115**, 404–7(1923).—Unusual changes were sometimes necessary during the World War. As a result Cu-impregnated SiO_2 brick and reverberatory slag, for instance, were both used. Either of these materials would be undesirable if used alone. It was found possible, however, by proper combinations to use them together. While there was a tendency toward formation of salamanders, even with unusual precautions, the practice was so developed as to get very satisfactory results, considering the unusual and difficult materials. W. discusses development of these changes in practice. H. C. P. (*C. A.*)

PATENTS

76. Ceramic ware and method of making the same. Charles W. Saxe. U. S. 1,454,000. A ceramic article consisting of an impervious portion of porcelain integrally united by vitrification with a porous portion of crystalline alumina granules bonded by vitreous clay material.

77. Process for making refractory products. Louis P. Kraus, Jr. U. S. 1,453,468. The method of treating refractory material consisting in roasting a ground mixture of the material and a combustible at such a clinkering temperature below its melting point as to produce a clinkered material in the form of spongy grains free from crystalline structure.

78. Graphite crucible. Hirosuke Nakamura, Kozo Nakamura and Hikoshima Rutsubo Kabushiki Kaisha. Japan. 40,310, Oct. 18, 1921. The wall of the crucible forms V-shaped layers; it is manufd. by the machine described in 39,334. Owing to the special construction of the wall, it is resistant to changes of temp. and is very durable. (*C. A.*)

79. Brick. G. Tumura. U. S. 1,446,238, Feb. 20. Crushed grains of liparite 1 and clay 3 parts are used together to form a brick which is light and fire-resistant. (*C. A.*)

BOOK

80. Manufacture and Uses of Abrasive Materials. Alfred B. Searle. London: Pitman. 127 pp. 2s. 6d. (*C. A.*)

Whiteware

81. Comparative examination of the structure of Japanese and foreign porcelains. R. Shigemune. *Tokio Industrial Lab. Rept.*, **27** [6], 59 pp.(1922).—Microstructure of 33 Jap. and 24 foreign porcelains, mostly table wares, has been examined. *1. Porosity of the body.* The max. and min. sizes of pores in each section are given. There are 2 kinds of pores. One of them which seems to have been produced in forming, is large and has indefinite shape. It is frequently long and slender along the surface of the body. Sometimes it is developed at right angles to the surface with round sections. The other kind of pore which seems to have been produced by the evoln. of water-vapor and gases is round and usually small. *2. Size of grains.* The max. and min. sizes of quartz grains in each section are shown in a table. *3. Appearance of ingredients.* The state of melting of quartz grains is described for each thin section. *4. Formation of sillimanite, and translucency of body.* The translucency of body depends on the degree of mutual melting of raw materials, amount of ferric oxide, d. in black spots produced by massing of iron due to the melting of biotite and other ferruginous minerals, and formation of sillimanite. Descriptions on sillimanite, black spot and biotite are given for each thin section. The thin sections may be classified by the degree of sillimanite-formation in (*a*) sections showing no sillimanite, (*b*) those in which some of feldspar grains are replaced by masses of fibrous minute crystals, (*c*) sections whose feldspar has been sillimanitized almost entirely and (*d*) sections whose ground mass contains fibrous minute crystals. Black spots are usually round, measure mostly 0.001–0.2 mm. and are only opaque body in the thin sections. The result of burning a body for cone 9, composed of Katogun kaolin 35%, Hakuhoto quartz 23%, Omishima feldspar 35%, and Tokiguchi kaolin 7%, to cones 9, 12 and 15 indicates that black spots grow in size but diminish in number, as the burning temp. rises. *5. Jap. porcelains.* Jap. porcelains may be classified in 2 groups. (*a*) Porcelain made of plastic clay, feldspar and weathered granite. Thin sections are usually light brown and have sillimanite in their groundmass. (*b*) Porcelain mainly made of decomposed acid rock. Porcelain which has been

mainly made of weathered liparite has no sillimanite in ground mass, though its feldspar grains are rarely sillimanitized. It is generally fine-grained and is light gray or white. The microstructure of Kutani wares which are made of Hanasaka rock (weathered quartz-porphyry) 5–6, Gokokuji rock (weathered quartz-porphyry) 4–5 and Nabetani clay 3–6, resembles that of porcelain (*a*). *6. Comparison of Jap. and European porcelains.* (*1*) *Pores.* Pores in the European porcelains are generally less and smaller than those in Jap. wares. (*2*) *Size of quartz grains.* Generally speaking, quartz grains in the European wares are smaller than those in Jap. porcelains. (*3*) *Appearance of quartz grains.* Quartz grains in the European wares have classified outline, while only a few Jap. porcelains show similar structure. (*4*) *Formation of sillimanite.* The European porcelains are generally superior to the Jap. in this respect. (*5*) *Translucency.* Jap. porcelains are generally superior to European in translucency. 39 microphotographs are given.

S. KONDO

82. Experiments on the manufacture of pure-white hard porcelain. MIKIYA AKATSUKA. *Rept. of the Pottery Lab.* (Kioto), **1**, 1–13(1922).—Many expts. were done with the purpose of producing pure-white porcelain with Korean kaolin as its chief raw material. The firing temp. was cone 14 all through the study. *1. Raw materials.* Korean kaolin of Daiyamen, Katogun, Keishonando, Gairome clay (highly plastic kaolin) of Tokiguchi, feldspar and quartz of Ehime prefecture, and talc of S. Manchuria were used. The Korean kaolin gave the following analyses: 45.06 silica, 38.44 alumina, 0.54 ferric oxide, 0.73 lime, 0.16 magnesia, 0.80 alkalies and 14.32 loss on ignition. *2. Compn. of body.* Its range was clay 54–67% (kaolin 33–53%, Gairome clay 6–21%), feldspar 21–29% and quartz 12–18%. These materials were used in air dry state. The content of moist. was as follows: kaolin 6.64%, Gairome clay 6.32%, feldspar 0.20%, quartz 0.08% and talc 0.08%. *3. Glaze formula.* Glazes tried were $\left.\begin{matrix}0.65\ K_2O\\0.35\ MgO\end{matrix}\right\}$ 0.75–0.90 Al_2O_3.9.5–10.0 SiO_2, $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 0.8–1.2 Al_2O_3.9.0–12.0 SiO_2, $\left.\begin{matrix}0.75\ K_2O\\0.25\ MgO\end{matrix}\right\}$ 1.0 Al_2O_3.9.0 SiO_2 and $\left.\begin{matrix}0.80\ K_2O\\0.20\ MgO\end{matrix}\right\}$ 0.85–0.95 Al_2O_3.8.5 SiO_2. They were composed of feldspar, Gairome clay, talc and quartz. *4. Bending and shrinkage of bodies.* Descriptions are given of the expts. *5. Forming.* The case of forming by hand wheel, pull-down and jigger, and casting were tested. 0.3% sodium carbonate was added to the casting slips. *6. Glazing.* Glaze slips rich in feldspar are liable to settling. Therefore, a small amt. of acetic acid (about 20–30 cc. for 72 l. cask) was added. Its effect is not temporary as that of ammonium carbonate. *7. Results.* (*a*) The suitable grinding time for bodies was 25 hrs. with 100 kg. wet grinding cylinder. It was 35 hrs. for glaze when the same grinding cylinder was used. Talc has to be ground for 20 hrs. before it is used in glaze batches. (*b*) The following bodies were excellent with respect to forming, cracking in drying and burning color:

Korean kaolin	Tokiguchi Gairome	Ehime feldspar	Ehime quartz
33	21	28	18
38	17	28	17
44	19	23	14

(*c*) Glazes of the formulae, $\left.\begin{matrix}0.65\ K_2O\\0.35\ MgO\end{matrix}\right\}$ 0.90 Al_2O_3.10.0 SiO_2, $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 0.90 Al_2O_3.10.0 SiO_2, $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 1.20 Al_2O_3.11.0 SiO_2 and $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 1.20 Al_2O_3.12.0 SiO_2 were satisfactory. The last glaze which was most excellent among them was improved further in color and luster by partly replacing the Gairome clay with the kaolin. The batch was as follows: Ehime feldspar 41.4, Tokiguchi Gairome 8.0, Korean kaolin 5.7, Manchurian

talc 4.0 and Ehime quartz 40.8. (*d*) Most of 27.4 cm. plates shrank to 24.6 cm., of which 0.1 cm. owed to glaze layers, in drying and burning. S. KONDO

83. Study of translucent hard-faience glaze. JISUI UYEDA. *Rept. of the Pottery Lab.* (Kioto), **1**, 14–56(1922).—*I. Purpose of the study.* Usual transparent hard-faience glaze exposes all defects on body just as they are. Moreover, it has an excessive luster like that of inferior glazes. On the other hand, porcelain has a fine appearance, since it is constructed of translucent body, glaze which is not fully transparent and a translucent intermediate layer. The purpose of the study was to produce a hard faience with an appearance of porcelain by improving the said properties of the glaze and also by coloring its body and glaze. *II. Single opacifiers.* (*a*) *Cryolite.* It has a tendency of producing devitrified spots. Otherwise, the result was nice. (*b*) *Fluorspar.* It acted like cryolite. The use of an engobe composed of 49.5% fluorspar, 41.3% feldspar and 9.2% Gairome clay under a transparent glaze is promising, though the uniform application of the engobe was not successful. (*c*) *Stannic oxide.* It makes the glaze matt or gives an appearance like an enamel. (*d*) *Antimony oxide.* It behaves like stannic oxide. (*e*) *Zirconia.* It acts like stannic oxide, but produces bluish shade instead of yellow with the latter. (*f*) *Zinc oxide.* Its action as opacifier is very weak. However, it makes the glaze white and bright. *III. Compound opacifiers.* (*a*) *Stannic oxide and fluorides.* Satisfactory results were first obtained with glazes containing 3% stannic oxide and 5% fluorspar or cryolite. Starting with the results, effects of variation in the amt. of stannic oxide, fluorine, alumina and silica were studied. Among numerous batches, the following proved to be the best for cone 01a:

$$\left.\begin{matrix}0.32\ PbO\\0.10\ K_2O\\0.20\ Na_2O\\0.38\ CaO\end{matrix}\right\}\ 0.30\ Al_2O_3\ \left\{\begin{matrix}3.60\ SiO_2\\0.40\ B_2O_3\\0.15\ F_2\\0.063\ SnO_2\end{matrix}\right.\qquad (a)$$

The batch was composed of 49.40% frit, 10.17% white lead, 11.17% Korean kaolin, 1.74% Gairome clay and 27.52% quartz. The formula of frit is

$$\left.\begin{matrix}0.191\ PbO\\0.119\ K_2O\\0.238\ Na_2O\\0.452\ CaO\end{matrix}\right\}\ 0.119\ Al_2O_3\ \left\{\begin{matrix}1.380\ SiO_2\\0.476\ B_2O_3\\0.178\ F_2\\0.075\ SnO_2\end{matrix}\right.$$

0.0475 ferric oxide and 0.00380 cobalt oxide were added to 100 frit batch. (*b*) *Stannic oxide and zinc oxide.* Excellent result was obtained with a glaze:

$$\left.\begin{matrix}0.32\ PbO\\0.10\ K_2O\\0.20\ Na_2O\\0.38\ CaO\end{matrix}\right\}\ 0.30\ Al_2O_3\ \left\{\begin{matrix}3.60\ SiO_2\\0.40\ B_2O_3\\0.12\ ZnO\\0.063\ SnO_2\end{matrix}\right.$$

composed of 50.0% frit, 10.1% white lead, 11.0% Korean kaolin, 1.7% Gairome clay of Tokiguchi and 27.2% quartz for cone 01a–02a. The formula of frit was

$$\left.\begin{matrix}0.190\ PbO\\0.119\ K_2O\\0.238\ Na_2O\\0.453\ CaO\end{matrix}\right\}\ 0.119\ Al_2O_3\ \left\{\begin{matrix}1.370\ SiO_2\\0.476\ B_2O_3\\0.143\ ZnO\\0.075\ SnO_2\end{matrix}\right.$$

0.0450 ferric oxide and 0.0045 cobalt oxide were added to 100 frit batch. (*c*) *Zirconia and fluorspar.* By introducing 0.07 ZrO_2 instead of 0.063 SnO_2 in the formula (1),

a good glaze was obtained. However, it was deficient in luster, although this was later improved by increasing the amt. of fluorspar. (*d*) *Antimony oxide and fluorspar.* Only a few expts. were done with these opacifiers, as antimony oxide is said to be poisonous. (*e*) *Bone-ash and fluorides.* Expts. with bone-ash and cryolite or fluorspar gave pretty good results, though the glazes were far inferior in translucency, luster and color to those with stannic oxide and fluorspar. *V. Coloring hard faience.* (*a*) *Coloring body.* The use of $CoSO_4.7H_2O$ or $Co(NO_3)_2.6H_2O$ is described. An example of nice bodies is: 60.0% of liparite of Amakusa, 18.0% Gairome clay of Tokiguchi, 17.0% amalgatolite of Mitsuishi, 5.0% feldspar and 0.058% cryst. cobalt nitrate (0.015% cobalt oxide). The batch was ground wet for several hrs. in a grinding cylinder. Then 0.0712% cryst. sodium carbonate was added and ground again. (*b*) *Coloring glaze.* The usual way of adding cobalt oxide to frit is not satisfactory, as it produces a blue with purplish gray shade. Therefore various mixts. were tried. Barium chromate gave greenish blue of porcelain glazes. For glazes contg. stannic oxide the use of a mixt. of cobalt oxide and ferric oxide in amts. of 0.0025–0.003% and 0.025–0.03%, respectively, in matured glazes is recommended. S. KONDO

PATENT

84. Sagger. ITSURO KASUGAI. Japan, 42,575 May 12, 1922. Holes are bored at the sides and bottom of a sagger with the purpose of saving fuel in the glost-firing of porcelain. S. KONDO

Equipment and Apparatus

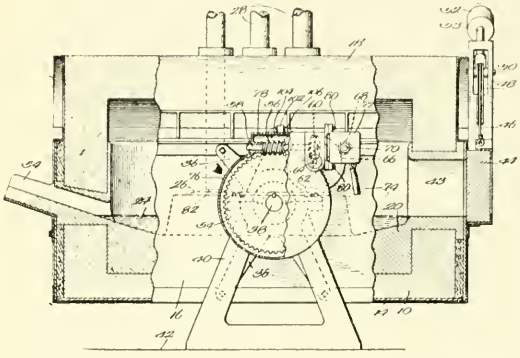
85. Compressibility of matter. Method and apparatus (patented) for measuring pressure exerted in a press. F. BONNET. *Rev. Mat. Constr. Trav. Pub.*, **162**, 58–60 (1923).—In compressing material, it is often necessary to know the pressure that is exerted in different parts of the press. For this purpose a modification of the Brinell method for hardness testing is applied. The device consists of a hard metal base plate, 5 cm. in diameter, that fits into a hollow hard metal cylinder. The base plate holds the metal sheath that is to register the pressure by indentation. The top of the hollowed cylinder is evenly bored out in three places, symmetrically located about its center, to keep in place 3 hard metal balls, each 1 cm. in diameter. These devices are then placed horizontally in different parts of the mass of material in the press, and then compressed. The pressure is evenly distributed over the surface of the device, the imprint on the metal sheath under each ball registering $^1/_3$ of the total pressure. The device is calibrated by plotting impression diameters against known pressures (*i. e.*, by weights). L. N.

86. Apparatus for photomicrography. G. DURANTE. *Compt. rend.*, **175**, 1201–3 (1922).—The app. described differs from the customary app. in that the source and microscope are hermetically sealed so that light cannot pass except through the ocular. A lamp with V-shaped filament gives a point source, all posterior rays being reflected by means of a spherical mirror. A rheostat affords adjustment for 3 different light intensities. Mirror, lamp, and condenser are enclosed in a jointed tube. The camera has the form and dimensions of a microscope case, through the top of which passes the ocular tube. The plate holder can be moved up or down on a rigid tube which is screwed on to the case but is demountable. The app. is readily portable, simple in operation, reasonable in cost, and has no bellows to limit size of exposure; by simple alignment of the plate, a strong magnification with feeble objectives is possible. With but small magnification, an image can be obtained at a distance of 2 m., which is bright enough to be seen readily by a limited audience. T. F. B. (*C. A.*)

87. New form of melting-point apparatus. H. A. BELL. *Ind. Eng. Chem.*, **15**, 375(1923).—A modification of the Thiele app. E. J. C. (*C. A.*)

PATENT

88. Electric furnace. ALFRED W. GREGG. U. S. 1,453,347. A metal receiving furnace box provided with doors through which material may be placed at one end, a pouring spout at the other end, means for leading electric current into the furnace to effect melting of material placed therein, trunnions extending from opposite sides of the furnace, intermediate of said spout and said doors, journal supports for the trunnions, an electric motor mechanism supported by a trunion for rocking the furnace on the trunnions and expansion permitting means on the support preventing rotation of the motor about the trunion axis.



Kilns, Furnaces, Fuels and Combustion

89. Tunnel kilns. K. DÜMMLER. *Deutch. Topf. Zieg. Ztg.*, **54**, 95–6(1923).—Considerable power is required to force cars through a continuous kiln. This may be reduced by using a pitch of 1 to 20 or at least 1 to 10 thus allowing gravity to assist in forcing the cars through the kiln. The objections to this method is that the cars are slightly tilted. This may be overcome by using 2 sets of tracks, one inside of the other. The back wheels of the car rest on the outer track whereas the lower and the front wheels rest on the inner track which are elevated thus allowing the cars to pass through absolutely horizontal. H. G. SCHURECHT

90. Problems of continuous kiln burning. MARK A. TAYLOR. *Brick and Clay Record*, **62**, 597–8(1923).—Burning in the Youngren type kiln is explained. Kiln has 18 chambers, fired with fuel oil. Chambers are 32 ft. long, $16\frac{1}{2}'$ wide and hold 40 to 50 T. drain tile or 70 to 80 T. of hollow ware. Ordinary firing period for a chamber is 36 hrs. with approx. 60 hrs. of preheating preceding. Attempt to obtain $\frac{1}{2}$ to $\frac{3}{4}$-inch shrinkage per hr. completing it in 12 hrs. Chamber is held at a finishing temp. of 1950°F for 3 hrs. Stack gases are below 200°F; draft is of major importance. Drain tile kilns are ordinarily set at 16″ draft while closer settings are given 0.02 to 0.04 inches more. Pyrometers, cones, trial pieces, water smoking thermometer and draft gages are considered important. Opinions of others desired. See *Ceram. Abs.*, **1** [11], 276(1922). J. W. H.

91. Automatic feeding of fuel in Hoffmann continuous kilns. F. DELORME. *Rev. Mat. Constr. Trav. Pub.*, **162**, 43B–47B(1923).—Review of a detailed acct. of the results obtained with a "Colomb" automatic feeding device, reported in *Chaleur et Industrie*, Jan., 1923. L. N.

92. Mechanical burning of brick and tile. H. COUËTOUX. *Rev. Mat. Constr. Trav. Pub.*, **162**, 48B–54B(1923).—Descriptions and plans of the Hirt patented machinery. L. N.

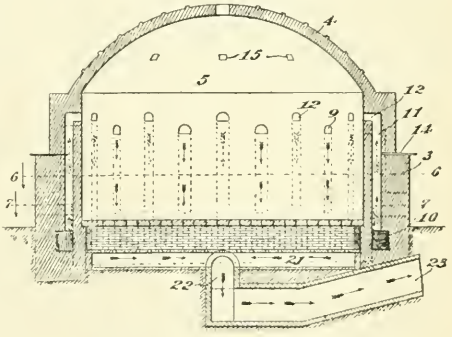
93. Methods of handling materials in the electric furnace and the best type of furnace to use. (Heat treatment.) F. W. BROOKS. *Trans. Am. Electrochem. Soc.*, **43** (Preprint).—A general discussion, with designs, of various types of elec. furnaces, such as, the plain box, the special box, the car, the recuperative and continuous types. Ad-

vantages and disadvantages of each and methods of handling the material to insure uniform temp. and high efficiencies are outlined. W. H. B. (*C. A.*)

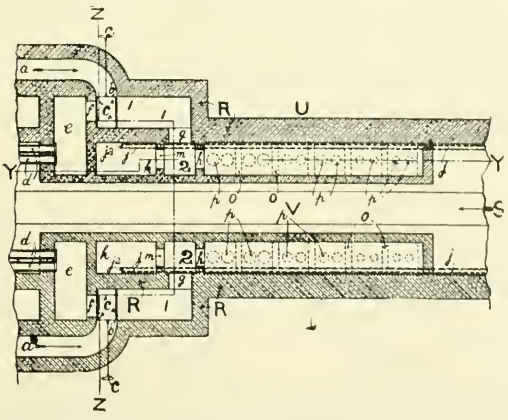
PATENTS

94. Improvement in kiln for burning brick and similar wares. TOKUSABURO SATO. Japan. 42,666, May 20, 1922. The kiln is provided with fire-boxes which have each a drop-arch and a channel-shaped wall at its rear. The drop-arch directs the flame produced on grate downward. The flame then strikes on the inverted-channel wall which is a kind of very low flash wall, situated much nearer to the grate than usual. The construction keeps the furnace-end hot and aids the complete combustion of gases. S. KONDO

95. Brick kiln. YASABURO SAITO. Japan. 42,989, June 30, 1922. This is a parallel ring kiln with 2 main flues between two burning channels instead of one as usual. Each main flue is connected with opposite burning channel by small flues which pass under the other. It has a drying chamber on the main flues. Another drying tunnel is constructed around the kiln. Pipes are imbedded in the kiln body over the crown. Hot air produced in them by conduction is utilized in drying bricks by connecting the pipes with the drying chamber and tunnel. S. KONDO

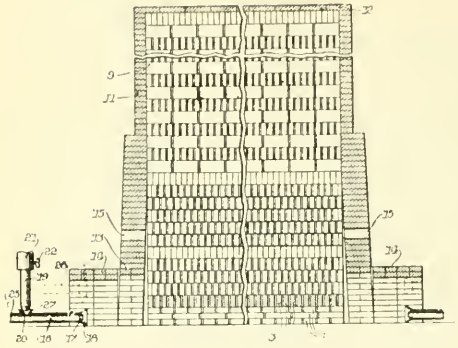


96. Kiln. ROBERT J. DYER. U. S. 1,452,638. A cylindrical kiln comprising a main wall having a smooth inner surface, a dome supported thereby, said main wall provided interiorly with a plurality of vertical flues each communicating at its upper end with the interior of the kiln, said wall being formed interiorly of its base with an annular duct with which the lower ends of alternate flues connect, said wall being further provided interiorly with a plurality of firepots opening at the exterior of the wall and one associated with alternate flues, and an outlet beneath said kiln connecting with said duct.



97. Gas-fired oven or kiln. JOHN HENRY MARLOW. U. S. 1,452,887. A tunnel oven or kiln provided on opposite sides with combustion chambers and air supply pipes, passages communicating with the combustion chambers, said passages decreasing in area towards the front of the oven or kiln, and a series of orifices which communicate with said passages. Cf. *Ceram. Abs.*, **1** [12], 301 (1922).

98. Method of and means for burning bricks. GRAFTON E. LUCE. U. S. 1,453,850. In a kiln, a stack of green bricks and a foundation of burned bricks, said foundation



of burned bricks having a furnace therein and said stack of green bricks having a furnace therein adjacent the furnace in the foundation, said furnaces being connected at intervals through a foraminous wall of burned bricks.

99. Gas producer. R. DAAE. U. S. 1,445,300, Feb. 13. The pat. relates to a mechanism for supplying fuel to a producer through a feed opening in the cover. (*C. A.*)

100. Pure cresol from crude tar acids. I. H. DERBY and W. HIGBURG. U. S. 1,445,668, Feb. 20. Crude-tar acids are treated with a small fraction of the chem. equiv. amt. of caustic alkali and after reaction the material is cooled, C_6H_6 or toluene is added and the material is extd. with H_2O_2 to sep. the alkali metal compds. (*C. A.*)

101. Removable-top continuous kiln. T. B. MOATS. U. S. 1,447,682, Mar. 6. (*C. A.*)

Geology

102. Bauxite. ANON. *Keram. Rund.*, **31**, 105(1923); *Mines, Cavueres, Grandes Entrepries*, **3**, Jan., 1923.—Bauxites are partly products of disintegration of feldspar rocks, such as granite syenite and gneiss. U. S. is the principal source of bauxite, 90% of the U. S. bauxite comes from the Saline district of Arkansas. Here there is a 3.3 m. strata of bauxite which was derived from syenite. The next important source in U. S. is that in Ga. in Andersonville of the Sumter district. Bauxite found in Ga., Ala., and Tenn. are usually mixed with white clays. The U. S. bauxites have 15 to 33% combined H_2O and varying amts., of hygro. H_2O. In Ark. the freshly mined bauxite is passed through a rotary kiln in which it is heated to 600°C, thus reducing the hygro. H_2O to $^1/_2$ to 1%. The bauxite which is used for abrasives, and refractories is calcined in a rotary kiln so that it contains less than 1% combined H_2O. In 1919, 272,270 T. were used for Al, 67,842 T. for chem. purposes, 35,395 T. for abrasives and 1,074 T. for refractories. Bauxites of good quality also come from Brit. Guiana in S. Amer. In France a red variety is obtained in Herault and Bonche-du-Rhône. The following data show the production of bauxite in different countries.

	1913	1917	1919	1920
U. S.	210,241	568,690	376,566	521, 308
France	304,323	118,973	160,820	186, 693
Dalmation-Istria	...	160,501	...	...
Italy	6,840	7,664	2,924	37, 360
Brit. Guiana	...	2,037	1,976	29, 390
England	6,055	14,724	9,221	...
India	1,184	1,363	1,682	...
Spain	...	...	1,751	...

The bauxite for Al must contain at least 52% Al_2O_3 and not more than 4% Si and 6.5% Fe_2O_3; for alum $Al_2(SO_3)_3$ the bauxite should contain at least 52% Al_2O_3 with a low content of Fe_2O_3 and TiO_2; for the production of refractories, it should contain a low content of Fe_2O_3. A new use for bauxite has been found in the production of a new cement. A mixt. of bauxite, coke and $CaCO_3$ is molten together. After cooling, the cement

is ground fine. This cement contains 50% CaO, 40% Al_2O_3 and 10% SiO_2. It is a very rapid setting cement and becomes harder after setting 24 hrs. than Port. cement after 28 days. It is resistant to sea waters. H. G. SCHURECHT

103. China clay (Cornwall, England). ANON. *Chem. Age*, **8**, 15(1923).—A fresh bed of fine china clay has been located at Cornwall: expts. have shown that it reaches to a depth of 60 ft.; and it is anticipated that there is an area of at least 20 A. O. P. R. O.

104. Sweden-stone quarries. ANON. *Swedish Yearbook*, p.129(1922).—The quarrying of various kinds of stone is of great industrial importance to Sweden; granite, marble, slate, sandstone, quartz, feldspar, and pot-stone are quarried. O. P. R. O.

105. Phosphates in Morocco. ANON. *Oil & Colour Trades Jour.*, **63**, 652(1923).—By the discovery of rich and vast phosphate beds, Morocco has become a potential factor of economic importance. These extensive beds of fine sand are phosphate of lime of a percentage varying from 68 to 78%. Estimates of their quantity vary from "many millions of tons." to "hundreds of millions." O. P. R. O.

106. Glass-making sands (Western Australia.) P. G. H. BOSWELL. *Chem. Eng. and Mining Rev.*, **15**, 199(1923).—Glass-making sands obtained in the neighborhood of Lake Guangara, W. A., are said to be of very high quality. B. states these sands are highly suitable for white flint glass, the best bottles, pressed ware, lighting glass, chem. app. and table ware. O. P. R. O.

107. China clay. Its composition, preparation and uses. H. F. COLLINS. *Chemistry & Industry*, **42**, 88–91, 114–7(1923).—A description of the compn., distribution, methods of working, purification, uses and economic importance of china clay. C. C. D. (*C. A.*)

Chemistry and Physics

108. Calculating heat losses in furnaces. O. I. HANSEN. *Blast Furnace & Steel Plant*, **10**, 437–40(1922); **11**, 117–22(1923).—The heat losses in boilers due to incomplete combustion of the fuel cannot be detd. with exactness with the ordinary Orsat app. H.'s method is to absorb the CO_2 in KOH and burn any H_2, CH_4 and CO present by heating the gas in a Pt capillary tube and observing the contraction. From this the percentages of combustible gases and the heat loss may be calcd. by suitable formulas. The analysis is carried out over Hg, and errors due to temp. change in the measuring buret are cut down by air cooling the water-jacketed buret and by using a compensating U-tube pressure equalizer. The method is claimed to be much superior to the ordinary Orsat method or to slow combustion or explosion methods. C. H. H., JR. (*C. A.*)

109. The rapid determination of potash in acid-insoluble silicates. Addendum. M. M. GREEN. *Ind. Eng. Chem.*, **15**, 429(1923).—Additional references are given. See *C. A.*, **17**, 501. H. G. (*C. A.*)

BOOK

110. Die physikalischtechnische Untersuchung keramischer Kaoline. JOHANNES STARK. Leipzig: J. A. Barth. 145 pp. M160. (*C. A.*)

General

111. Clay products output. ANON. *Brick and Clay Record*, **62**, 689–90(1923).—Detailed statistics of clay products output for years 1921, 1919, and 1914. J. W. H.

112. Symposiums: Casting of clay wares and oil firing of kilns. ANON. *Clay-Worker*, **79**, 462–3(1923).—Abstracts of papers read at annual meeting of N. J. Clay workers Assn. and the Eastern Section of AMERICAN CERAMIC SOCIETY, New Brunswick, N. J., December, 1922. J. W. H.

113. Ceramic Industries—Sweden. ANON. *Swedish Yearbook*, p.130(1922).—Brick, china, glass, cement and lime industries are the most important mineral industries in Sweden. O. P. R. O.

114. Air humidity and drying. P. H. PARR. *Intern. Sugar J.*, **25**, 16–20(1923).—Tables give for dry air the vol. and total heat per lb. and for satd. air the vapor wt., vol., total heat and heat increase per degree F from 40° to 100°. By the use of these tables the amt. of heat required to dry a given wt. of sugar to any given moisture content can readily be ascertained. W. L. O. (*C. A.*)

PATENTS

115. China clay. N. TESTRUP. U. S. 1,446,949, Feb. 27. Wet china clay contg. a large amt. of liquid is freed from superfluous liquid until a layer is obtained of small av. liquid content, varying through the layer, and clay is removed from the denser portion of the layer and fed as a film on to a drying surface heated by compressed vapor to a temp. only slightly in excess of that necessary to evap. the moisture in the clay. (*C. A.*)

116. Coating ceramic ware. METALLISATOR GES. Brit. 189,085, May 24, 1922. Ceramic cooking vessels are coated with Al or Fe. The vessels are heated to a temp. of 300–400° and the metal is applied by any of the known metal dusting processes. (*C. A.*)

117. Process of making vulcanization accelerators. PAUL I. MURRILL. U. S. 1,453,515. The process of making an oxidization product of a metallic salt of an organic acid, which comprises, condensing dimethylamine with carbon bisulfide, precipitating with an aqueous solution of zinc sulphate to form an insoluble zinc salt, and then oxidizing the precipitate.

BOOK

118. Water glass. A bibliography. MORRIS SCHRERO. Pittsburgh, Pa.: Carnegie Library. 83 pp. (*C. A.*)

CERAMIC ABSTRACTS

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Vol. 2 August, 1923 No. 8

Author Index[1] to Abstracts for August

Author	Number of abstract
Allen, H. E.	33
Allen, T. B.	1
Anon.	4, 11, 12, 13, 17, 46a, 47, 48, 58
Anspach, M.	20
Barton, L. E. and Kinzie, C. J.	88
Beecher, M. F. and Booze, M. C.	56
Bell, W. J.	70
Booze, M. C.	3
Bondouard, O. and Lefranc, J.	80
Budnikov, P. P.	5
Budnikov, P. P. and Syrkin, J. K.	81, 93
Cassidy, P. R.	53
Clarke, J. R.	15
Cooper, R. B.	40
Danehower, F. B.	51
Davenport, R. W.	69
Day, D. T.	98
DuNouy, P. L.	82
Ellenwood, J. W.	97
Feldenheimer, W. and Plowman, W. W.	94
France, W. A.	50
Frozeth, E. E. and Blixt, T.	54
Fukata, S.	61
Gaillard, J.	67
Gillot, M. and Guillermin, V.	65
Goldschmidt, V. M.	90
Graham, H. W. B.	46
Gray, W.	21, 31
Grönwell, E. A. A.	71
Grover, J. E.	95
Haire, R. E.	89
Hardinge, H. W.	72, 73
Howard, H.	91
Hüttl, A.	59
Ishikawa, J.	7
Kato, K.	9
Kawamoto, T. and Kato, G.	60
Kelly, A.	86
Kirlin, I. M.	32
Kissner, H. and Blum, D.	63
Klinefelter, T. A.	62
Krusee, A. W.	41
La Vercombe, H. H.	2
Lents, J. M.	30
Longaker, M. S.	74
Lorenz, W. A.	24
Marino, Q.	6
Martin, F. M.	96
McElroy, R. H., Cite, J. D. and Langenkamp, A. G.	45
McKay, P. A.	84
Mellor, J. W.	79
Miller, W. J.	26
Minton, L. H.	92
Moorshead, T. C.	27
Needham, E. F. and T. H.	42
Negbaur, H.	18
Norton, C. L.	52
Owens, M. J.	35
Pearson, R. E. and Craig, E. N.	58
Penfield, R. C.	37, 38
Ployer, A. W.	10
Pond, H. O. and Mellen, A. W., Jr.	39
Powell, H. J.	36
Powell, J. M.	77
Powell, J. R.	23
Réol, J.	75
Ruff, O.	87
Ryde, J. W. and Huddart, R.	16
Smith, R. D.	34
Smith, W.	49
Soubier, L. D.	29
Spackman, H. S.	8
Steelman, L.	19
Steinberger, L.	64
Stocke, J., Jr.	43
Stripe, W. C.	55
Sturtevant, T. J.	76
Sullivan, W. J.	44
Taylor, W. C.	28
Tucker, G. M.	57
Walker, T. L.	83
Wells, J. C. and Tillyer, E. D.	25
Wentzel, C. E.	78
Westman, A. E. R.	68
Wetmore, M. P.	22
Winslow, C. E. A.	14
Wollaston, T. R.	66

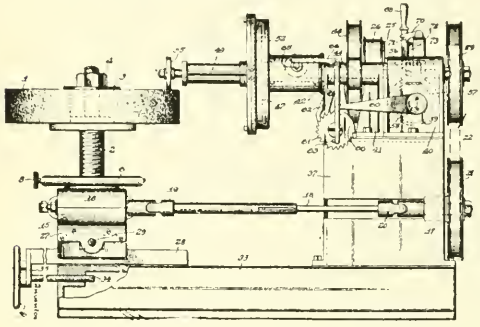
[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

PATENTS

1. Process of manufacturing aluminous abrasives. THOMAS B. ALLEN. U. S. 1,448,586, Mar. 13. The process of manuf. of aluminous abrasive, which consists in smelting an aluminous ore with aluminium by means of electrically developed heat.

2. Grinding-wheel-test device. HARLEY H. LA VERCOMBE. U. S. 1,446,977, Feb. 27. A machine for detg. the grade of abrasive bodies, having in combination means for supporting a body, a disk, power actuated means for rotating the disk in contact with the body, and means for moving the disk away from the body when the disk has been given a predetermined number of rotations, said means for moving the disk away from the body being controlled by the means causing rotation of the disk.



3. Nonslip quartz tile. MACDONALD C. BOOZE. U. S. 1,451,456, Apr. 13. A non-slip tile comprising abrasive quartz granules and a ceram. bond uniting said grains into an integral, wear-resisting mass in which the grains form the major portion of the tread surface, said bond being more wearable than the quartz and capable of permitting renewal of the tread anti-slipping characteristics under a normal usage.

Art

4. Colored glazes in the ceramic industry. ANON. *Chem. Trades Jour. and Chem. Eng.*, **72**, 570(1923).—Utilization of the less common metals, for decorative ceramics: The oxides and compds. dealt with in this article are those of uranium titanium, cerium and allied metals, zirconium and tungsten; and they will be considered solely as constituents of glazes and enamels. Uranium compds. are of great value as the oxide of uranium can produce varying colors, depending upon the nature of the glaze and the conditions of working. The yellow oxide, or sodium uranate, gives a deep orange color in combination with a lead glaze, but with leadless or low-lead glazes, the color produced is lemon yellow, particularly in the presence of boric acid. In general, the greater the amt. of lead in the glaze, the richer is the orange color for a constant amt. of uranium. The color produced in lead glazes is not necessarily orange, for a peculiarly rich vermillion red has been produced by the use of certain propns. of sodium uranate in a lead glaze contg. zinc oxide. At high temp. (cone 8) uranium is said to be suitable for the production of colors in leadless glazes, but is somewhat difficult to use. The yellow oxide is the most suitable in porcelain glazes, maturing at cone 10, sodium uranate gives pleasing light yellow colors, but only a slight increase in color is brought about by a considerable increase in the amt. of uranium. In such glazes pleasing slate colors can be produced by glazes containing oxides of cobalt and uranium. At lower temps. green glazes can be made by blending cobalt and uranium oxides in suitable propns., and with these glazes there appears to be no danger of that discoloration often produced by the more common green chromium glazes. One of the effects of the addn. of a little cobalt seems also to be the prevention of the irregularity of color often produced by uranium alone. When fired under reducing conditions porcelain glazes contg. from

10 to 15% of black uranium oxide give brilliant but expensive jet blacks. Sol. salts of uranium are sometimes employed as under or over-glaze colors. As an under-glaze color, uranium nitrate, with a suitable base, gives good yellows under oxidizing and neutral conditions, and good greys and blacks in reducing atmosphere. As an over-glaze color, uranium nitrate has been employed in polychrome terra-cotta, the ware being first sprayed with the glaze or slip to be used as a base and the soln. of the sol. salt being applied to the required area by hand painting. It has been found that a soln. in glycerin gives the best results, since water alone allows the brush marks to show, while glycerin is not absorbed so quickly and thus permits the successive brush marks to mingle. Suitable dyes can be used to show the painted areas. Pleasing colors have been obtained by combining uranium nitrate with nitrates of iron, manganese and chromium, and with sulphate of cobalt. With the high uranium and low cobalt, greens are obtained, while with lower uranium and higher cobalt, blue glazes are produced. In combination with vanadium, as uranium vanadate, uranium is said to give an old ivory effect. The resinates of uranium, sometimes in combination with those of iron, bismuth, or gold, are used for the production of colored lusters. Titanium dioxide has been used to some extent as a coloring agent in porcelain glazes. It has been found that the addn. of 5% of C. P. titanium dioxide gives a pleasing light yellowish tint to a porcelain glaze, while the addn. of a further 5% intensifies the color to a deeper straw. 5% rutile in a similar glaze gives a good light corn yellow, while 10% gives a deeper color; but it is possible that in the last case the color may be partly due to ferruginous impurity in the rutile. When painted on the surface of a felspathic slip rutile gives good light buff and buff browns, but in this case also the color may be due mainly to iron. In combination with cobalt and a little oxide of iron, rutile can yield excellent greens, though the color is not quite so bright as that obtained in the presence of some uranium. The most promising field for the use of titanium oxide in glazes appears to be in the development of those of a cryst. nature. Extremely beautiful cryst. effects have been produced in stoneware glazes by the use of rutile; and the addn. of small quantities of the oxides of molybdenum, tungsten, vanadium or uranium has been found to promote the development of the crystals and to give pleasing colorations. Wonderful cryst. effects have also been produced by introducing rutile into a china glaze contg. zinc oxide, and the titanium appears to be essential for the production of good crystals. Titanium dioxide has been found to be a useful opacifying agent for enamels, since it produces unusual durability and a very glossy surface which is resistant to abrasion. Cerium and allied metals: little information, beyond scattered references, chiefly in German lit., is available regarding the use of cerium compds. in glazes. Calcined cerium phosphate, after fritting with niter at cone 13 is said to yield at temps. between cones 9 and 14, with felspathic and other glazes, brilliant yellows which are resistant to oxidizing and reducing conditions. Cerium carbonate and cerium oxide (from the calcination of the oxalate) have been found to give good results when used as opacifiers in enamels for iron ware. Further investigations regarding the coloring power of cerium compds. in glazes of varying compn. would not only possibly prove to be of value to the ceram. indus., but would also help, if satisfactory results were obtained, to find an outlet for a portion of the large quantities of cerium compds. produced as residues of the rare earth industry. At present only a small fraction of the total cerium earths produced from monazite can be utilized. With regard to the utilization in the ceram. indus. of the other elements of the cerium group, there is little information published, but praseodymium, and neodymium phosphates have been employed to a limited extent in porcelain manuf. Tungsten and zirconium: Information regarding the use of these metals in glazes is even more difficult to find than is that concerning cerium. Good brown colors have been produced by means of phospho-tungstic acid, while similar results are obtained by the use of tungstic acid

in combination with iron and manganese. Results of doubtful value have been recorded with tungstic acid as an active agent for the development of under-glaze reds. Calcium tungstate, in combination with small quantities of a thorium or radium salt, imparts self-luminous properties to colored lead glazes, the luminosity being permanent when radium is used, but somewhat transient in the case of thorium. It is well known that zirconia has been found to be a good opacifying agent in enamels, but it does not appear to have been used in pottery glazes. O. P. R. O.

5. Gilding glazed clay vessels. P. P. Budnikov. *Ber. Polyt. Iwanowo-Wosniessensk*, **6**, 211–20(1922).—B. has examined various methods of gilding glazed clay ware. A suitable gilding soln. is produced by pptg. Au from soln. in aqua regia by hydrous $FeSO_4$. The ppt. is ground with 8–10% of a flux consisting of 6 pts. of basic Bi nitrate and 0.5 pt. of anhyd. borax, mixed with oxidized turpentine and lavender oil, and applied to the wares. A bright Au film is produced after baking at 650–900°. Paler hues are obtained if about 30% by wt. of AgCl is mixed with the gold. "Sulfur balsam" may likewise be employed for gilding. 100 g. of dry French turpentine are mixed with 20 g. of S and 20 g. of Venetian turpentine and boiled gently on an oil bath. Acid must be distd. off at intervals, and it is best to carry out the distn. in a stream of CO_2, a long glass tube being employed as a reflux condenser. To 8–9 pts. of the balsam so prepd., a soln. of $AuCl_3$ contg. 1 pt. of Au, 4 pts. of concd. HCl, and 4 pts. of HNO_3, diluted with H_2O, is added, and the mixt. heated on an oil bath until the Au dissolves. H_2O is removed, and 7–8% of lavender oil and 12% of French turpentine are added, and the mixt. is heated until completely mixed. The resulting mass is dissolved in CS_2 and filtered. The CS_2 is evapd. off, and 5–8% of basic Bi nitrate added, and the resulting mass applied to the wares, which are then carefully baked at 450–600°. The reactions occurring have been investigated by studying the interaction of S and pinene. $C_{10}H_{16}S$ or $C_{10}H_{16}S_2$ is probably formed by reaction between pinene and S. With $AuCl_3$, the compd. $C_{10}H_{16}S.AuCl_3$ is probably formed, and by baking, this is probably decomposed into $C_{10}H_{16}Cl_2$, Au and SCl_2. Gold sulfide gives only a mat film, under the conditions of the expts. "Sulfur balsam" may be prepd. by the interaction, at room temp., of S_2Cl_2 and turpentine, the evolution of H_2S and HCl being prevented by cooling. Used in conjunction with $AuCl_3$ this gives even better films than the first-mentioned balsam. J. S. C. I.

PATENTS

6. Metallizing articles. Quintin Marino. U. S. 1,452,281, Apr. 17. A process of metallizing articles composed essentially of non-conductive ceram. ware, which comprises applying to the surface of the article, while such surface is substantially free from glaze, a soln. of silver nitrate in an alcoholic solvent, allowing the alcohol to evap. applying to the surface a reducing agent contg. the formic acid radical, brushing the surface of the article with a metallic brush, applying to the surface of the article, a warm soln. containing silver cyanide, washing the article, and thereafter electro-depositing a metallic coating upon said article. Cf. *Ceram. Abs.*, **1** [8], 217(1922).

7. Gold coating mixture for glass or porcelain. Jiro Ishikawa. Japan. 40,632, Nov. 14, 1921. Ten g. of Au is dissolved in aqua regia, 38.5 g. of "balsam sulfide" is added and the mixt. evapd. to dryness on a sand bath. The residue is washed with H_2O, and mixed with Al, U, and Bi resinates and the whole is dissolved in a mixt. (*A*) of 200 g. of lavender oil, 100 g. rosemary oil, and 100 g. $PhNO_2$. "Balsam sulfide" is prepd. from 60 g. turpentine, 36 g. oil of turpentine, 16 g. flowers of S, 50 g. lavender oil, 10 g. $PhNO_2$ and 20 g. rosemary oil. The 3 resinates are prepd. from (1) K alum 50 g., resin soap 100, Al soap 10 and *A* 190; (2) U nitrate 50 g., resin soap 100 g., and *A* 150 g., (3) Bi subnitrate 2.3 g., resin 15.3 g. and lavender oil 32 g., resp. (*C. A.*)

Cement, Lime and Plaster

8. Alca cement. H. S. SPACKMAN. *Concrete* (Mill Section), **22**, 35–6(1923); cf. *Ceram. Abs.*, **1** [12], 337(1922).—Alca (= Al + Ca) cement has been manufd. in Europe since 1912, from bauxite and limestone. Its av. chem. compn. is CaO 35–45%, Al_2O_3 35–45%, Fe_2O_3 5–12%, SiO_2 5–12%. The cement is now made at 3 French works and at 1 Swiss works. Each works sells the cement under its own trade name, such as "Ciment Electrique," "Ciment Fondu," etc. Alca cement attains a very high early strength, and evolves considerable heat while setting, which favors its use in cold weather. Alca cement could be manufactured in the U. S. from native raw materials but the cost would be higher than for Port. cement. Economy in using the material tends to offset the high cost of production. J. C. W. (*C. A.*)

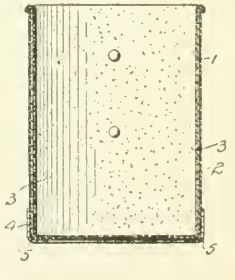
PATENT

9. Waterproof hardening agent of cement. KOMAKICHI KATO. Japan. 40,368, Oct. 19, 1921. The agent is a mixt. of soy-bean protein 100 g., NaOH 50 g., $Al_2(SO_4)_3$ 35 g., and AcONa 30 g. It is used by painting its aq. soln. with a brush on materials manufd. from cement or by mixing with cement. NaOH may be replaced with a mixt of Na_2CO_3 and $Ca(OH)_2$; $Al_2(SO_4)_3$ with alum and AcONa with soap or $Ca(AcO)_2$. (*C. A.*)

Enamel

PATENT

10. Enamel-ware protector. ALBERT E. PLOYER. U. S. 1,447,180, Mar. 6. The combination of a vessel enameled on the outside, and a protecting-ring of copper, arranged around the lower portion of the vessel, and having an annular integral portion extending inwardly under the bottom of the vessel.



Glass

11. Hydraulic mining of silica a marvel of mechanical ingenuity. ANON. *Glass Container*, **21**, 30(1923).—Described methods practiced at Clayton, Ia., where 5 men handled 7 carloads of glass sand per day, or almost 400 cu. yds. without touching the sand. Sand is 99½% pure. Illustrations. Deposits are enormous. One area of almost pure silica stretches for 10 miles at an elevation of 952 ft. A hydraulic stream, tumbler, separating vats and cars are all the equipment necessary. Fifty-five ton cars are loaded in 18 min. W. M. C.

12. Study of the return and breakage problem of milk bottles. ANON. *Glass Container*, **9**, 10 and 45(1923).—Part II. Checking up on mechanical operations in milk plants and careful supervision of delivery men result in reduced breakage and greater returns. With illustrations, Sheffield Farms, Inc., one of the largest N. Y. companies expends between $700,000 and $800,000 per annum for milk bottles. Breakage in washing averages between 1 and 2%. W. M. C.

13. Electric glass furnace. ANON. *Schnur. Rev. Glass Works*, **7** [74], 1563 (1923).—Not used because of cost, high local temp. and poor color of the glass due to carbon. The advantages are simpler installation, shorter melting period, cleaner furnace and a small furnace may be used. Power required is 2 kilowatt hour for 1 kg. of metal. R. J. M.

14. Health problems of industry. C. E. A. WINSLOW. *Glass Worker*, **42** [32],

11(1923).—A series of 8 special articles on this subject including efficiency, ventilation, lighting, dust, sanitation, fatigue, etc. R. J. M.

15. Fluorescence and coloration of glass produced by β-rays. J. R. Clarke. *Philosophical Mag.* (London), **45**, 735–6(1923).—Glass tubing, after treatment with radium emanation until the color change is complete, was heated at different temp., and the rate of decolorization and the duration of fluorescence measured. The duration of fluorescence in min. ranges from 13 at 110° to 0.5 at 350° C. At the annealing temp., the change is practically instantaneous. It is probable that the fluorescence and decolorization are associated with changes in the state of mol. aggregation of the glass. When manganese is present in the glass the color after radiation is purple, whereas the normal color is brown. Cf. *Ceram. Abs.*, **1** [12], 328(1922). O. P. R. O.

16. Analysis of bubbles in glass. J. W. Ryde and R. Huddart. *Royal Phys. Soc. of London*, April 27(1923).—The analysis of bubbles in glass has been investigated by the research staff of the Gen. Elec. Co. of London: In order to distinguish bubbles generated by chem. action in glass from those introduced by mechanical processes spectroscopic tests are made for the presence of nitrogen. In order to liberate the gas from the bubbles a specimen of the glass was placed in one limb of a quartz U-tube and mercury in the other, and the glass was heated and then disintegrated by sudden cooling, the tube being plunged into cold water at the same time the mercury was thrown on to the glass. The method does not readily lend itself to quantitative applications, as the line intensities are much affected by the fact that the discharge takes place in a mixt. of gases. O. P. R. O.

17. Daughters of American Revolution plan to preserve ruins of old glass factory. Anon. *Glass Container*, 22, 38, 40(1923).—Old Pitkin Plant at Manchester, Conn., of historic interest to state and industry started in 1783. W. M. C.

PATENTS

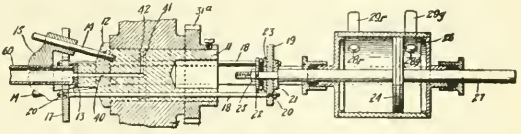
18. Ovenware and holder therefore. Harry Negbaur. U. S. 1,450,330, Apr. 3. A baking dish made of transparent boro-silicate glass having a yellowish tinge and provided with mineral coloring material fused into the glass near one surface, whereby the dish is rendered translucent and colored.

19. Leer. Lewis Steelman. U. S. reissue 15,603, May 15. An annealing leer for hot glass articles, comprising a heated fur. portion at the entry end of the leer and a tunnel portion having a gradually decreasing temp. extending therefrom to the exit end of the leer, the leer being arranged for continuous movement of the articles through the heated and tunnel portions to anneal the same in a gradually decreasing temp., the fur. portion comprising a muffle chamber with an open end leading into the tunnel extension flues surrounding the muffle portion of the leer chamber in which the articles to be annealed are placed, the side portions of which consist of a plurality of vertically extending flues, said flues being formed of interlocking tiles, an air and gas supply to the flue system, connections within the fur. structure for directing the flame and products therefrom substantially evenly on both sides of the muffle in the side flues, a conduit system beneath the heated muffle chamber in heating relation to its floor, said system receiving the products of combustion from the side flues and leading the said products of combustion in a horizontal longitudinal flow to stack connections, said stack connections being out of the path of travel of the articles being annealed and intermediate the length of the leer and adjacent the end of the heated portion, substantially as described.

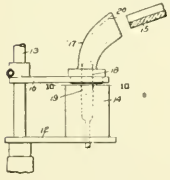
20. Glass tile for covering walls. Marcel Anspach. U. S. 1,454,842, May 15. A method of prepg. glass tiles for wall coverings consisting in coating the back of said tiles with a paste contg. a clayey earth, oil, turpentine, a resinous varnish and a siccative, and baking at a moderate temp. the tiles thus coated.

21. Glass-drawing apparatus. WILLIAM GRAY. U. S. 1,449,038, Mar. 20. (See *Abs.*, **31**, p. 178).—An app. for drawing sheet glass comprising an endless member for carrying the sheet, an endless member of greater length associated therewith, teeth on said latter member to engage the margin of the sheet on one side, a shorter endless member with teeth to engage the margin of the sheet on the other side, and a sep. cooling bath for each of the last two endless members.

22. Glass-blowing machine. MINER P. WETMORE. U. S. 1,446,026, Feb. 20. The combination, with a revolving chuck having radially movable jaws of an operating connection from said jaws through the chuck spindle, rotatable therewith, a ball bearing on the rear of said connection, and means for producing movement of said ball bearing along the line of the axis of the chuck spindle.

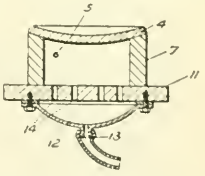


23. Apparatus for the manufacture of bifocal lens blanks. JOHN R. POWELL. U. S. 1,451,957, Apr. 17. In an app. for fusing bifocal lens blanks comprising a support for the major lens blank and a support for the minor lens pivotally mounted thereon having its free edge extended over the edge of the major lens support.

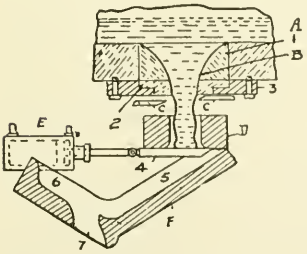


24. Process of and apparatus for feeding molten glass. WILLIAM A. LORENZ. U. S. reissue 15,600, May 15. In an app. for handling gathers of molten glass the combination with a conducting trough and a shaping mold of a curved inclosing funnel located between the delivery end of the trough and the mouth of the mold for conducting the gathers from the trough to the mold and shaping them while being so conducted.

25. Antæus glass. JOEL C. WELLS AND EDGAR D. TILLYER. U. S. 1,454,200, May 8. The process of producing protection lenses consisting in heating the lens uniformly and subsequently cooling one face of the lens while the other is in a plastic condition. The process of producing a curved protection lens consisting in surfacing the faces of the lens in flat form, subjecting the blanks after surfacing to sufficient heat to drop the lens to desired curve without impairment of the polished surfaces thereof, and suddenly chilling one face of the blank to produce a surface tension in the finished blank, increasing the resisting properties thereof.



26. Process and apparatus for feeding glass. WILLIAM J. MILLER. U. S. 1,451,707 Apr. 17. The method of feeding molten glass from a container provided with a discharge orifice through which the glass is caused to protrude which consists in accumulating the glass beneath the discharge orifice to form gathers, detaching said gathers from the glass protruding from said orifice, discharging said detached gathers, and reversing the gathers after they are discharged, for the purpose described.



27. Machine for making pressed glassware. THOMAS C. MOORSHEAD. U. S. 1,445,345, Feb. 13. A machine for making pressed glassware, comprising, a source of glass supply, a mold, a receiver adapted to gather a measured quantity of glass from said source means for dipping and for exhausting said receiver to gather the glass including main and auxiliary valves in series, said main valve being adapted to re-

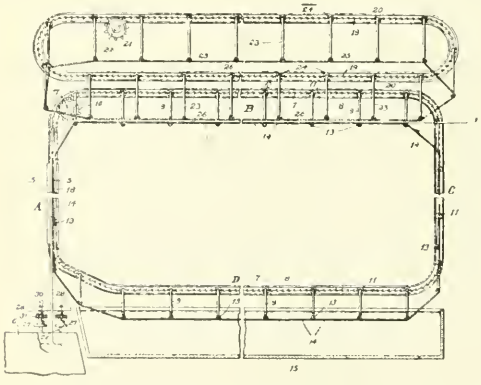
main open for the full dip of said receiver, and said auxiliary valve being adapted to close before said receiver rises, means for depositing the glass in said mold, and a former adapted to coöperate with said mold to press the glass to shape. In a machine for making glassware having glass molding means including a mold, mechanism for removing the formed article from the mold, comprising an ejector movable through the bottom of the mold, a coöperating retainer movable over the top of the mold, and means for removing the article from said ejector and said retainer.

28. Glass and process of making same. William Chittenden Taylor. U. S. 1,449,799, Mar. 27. The hereinbefore described method of overcoming the yellow tint imparted to acid boro-silicate glasses by iron oxide which consists in adding a salt of neodymium oxide to the batch from which such glass is melted.

29. Means for transferring glass to molds. Leonard D. Soubier. U. S. 1,446,670, Feb. 27. A glass transfer device comprising a reciprocable carriage, a sectional transfer cup on said carriage and reciprocable therewith from a receiving position to a discharging position, the upper end of said cup being open to receive glass, and the section of the cup on the side towards the receiving position being slidable away from the other section, resilient means normally holding the sections together, and a stop for arresting the slidable section as it approaches discharge position and thereby opening the cup.

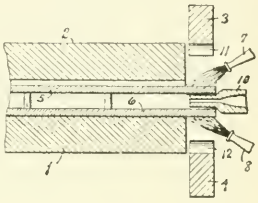
30. Means for transferring molten glass. John Murl Lents. U. S. 1,446,649, Feb. 27. In gob transferring mechanism, the combination of a gob transferring device rotatable about a horizontal axis and provided with a series of cups arranged at intervals around its periphery, means to rotate said device step by step and thereby bring said cups successively to a receiving position, said rotating means comprising a rock arm, means to rock said arm, a rotary member connected to rotate said transfer device, a connecting pin carried by said arm, automatic means to actuate the pin and connect said arm with the rotary member for rotation therewith while the arm moves in one direction and to disconnect said pin and permit said member to remain stationary during the return of said arm, a locking pin, and automatic means to move said locking pin into engagement with said rotary member and hold the latter in locked position while disconnected from the rock arm.

31. Glass-drawing apparatus. William Gray. U. S. 1,450,590, Apr. 3. In app. for drawing glass, the combination with a reservoir for molten glass, of drawing app. located thereover, and upright shafts located on opposite sides of the margins of the sheet being drawn and having outstanding fingers that engage said margins between the drawing app. and reservoir, to maintain a predetd. width to said sheet. In an app. for drawing sheet glass, the combination with a reservoir for the melted glass, of means for drawing a continuous sheet of glass vertically therefrom and then bending the sheet into the horizontal plane, comprising two endless series of articulated flat plates, the sheet being guided by one series of plates in its vertical run, and gripped between the two series in its horizontal run.

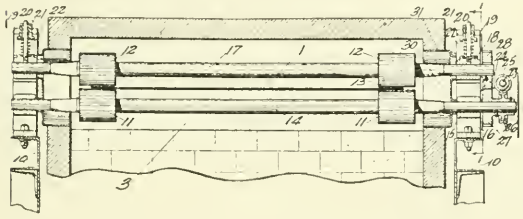


32. Process of making hollow panes of glass. Ivan M. Kirlin. U. S. 1,448,351,

Mar. 13. The process of forming hollow panes of glass which consists in heating two similar sheets of glass between flat retaining plates, introducing a tube between the edges of the sheets at one point, heating the edges to fusing point and forcing them together and around the tube to hermetically seal the edges together and the tube in position and at the same time forcing air through the tube into the space between the sheets to hold them against the retaining plates, cooling the pane until no longer malleable, and then exhausting the air from its interior.

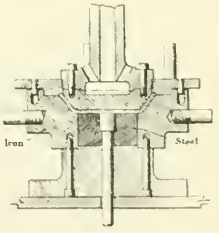


33. Leer conveyor for sheet glass. HORACE E. ALLEN. U. S. 1,450,571, Apr. 3. In a leer for continuous sheet glass, a series of idler rollers for supporting the glass sheet, and a series of means engaging the sheet between certain of the idler rollers at spaced intervals throughout the leer for advancing the sheet over the idler rollers. In a leer for continuous sheet glass, a series of idler rollers for supporting the glass sheet, a series of idler edge rollers, resting freely on the upper edge portions of the glass sheet to hold the sheet in rolling contact with the supporting rollers, and pairs of driving rolls engaging the edges only of the sheet for advancing the sheet through the leer.



34. Mold. ROWLAND D. SMITH. U. S. 1,449,789, Mar. 27. A part for molding glassware made of a steel containing from 10% to 15% chromium, and from $^1/_2$% to 5% cobalt.

35. Mechanism for conveying hot glassware. MICHAEL J. OWENS. U. S. 1,455,966, May 22. In app. for transferring hot glassware, the combination of an inclined chute down which articles are carried by gravity, a horizontally traveling conveyor, a table beneath the chute onto which the articles are discharged from the chute, said table being rotatable about a vertical axis and in substantially the same horizontal plane as said conveyor, and means to guide articles from the table onto the conveyor, the point at which the articles are discharged onto the table being so arranged that the articles are carried on the table through the greater portion of a complete rotation and pass beneath the chute to the conveyor.



BOOK

36. Glass-making in England. HARRY J. POWELL. New York: Macmillan Co. 183 pp. $10.

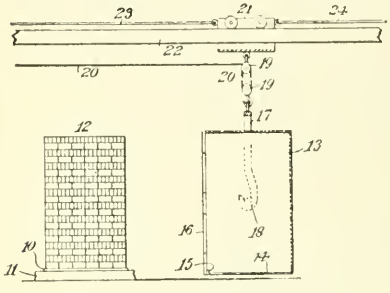
Heavy Clay Products

PATENTS

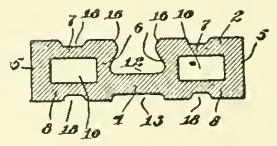
37. Apparatus for unloading kilns by hopper, lifting device, or the like. RAYMOND C. PENFIELD. U. S. 1,444,206, Feb. 6. App. of the kind described, comprising a brick carrying hopper, adapted to be positioned adjacent a stack of brick, rods adapted to slide on said hopper and extend forwardly thereof over the stack of brick, means on the outer ends of said rods to separate a predt. mass of brick from the stack and means to retract the rods and thereby slide the mass of brick thus sepd. into the hopper.

38. Apparatus for unloading kilns by conveyer belts. RAYMOND C. PENFIELD. U. S. 1,444,207, Feb. 6. Mechanical brick handling app. of the kind described comprising continuously moving brick engaging devices adapted to separate a plurality of brick in a stack, and to move the same from stacked position, comprising means to maintain the brick engaging devices in a substantially vertical line while entering the plane of the brick to be removed.

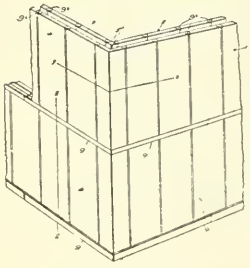
39. Brick-handling apparatus. HENRY O. POND and ARTHUR W. MELLEN, JR. U. S. 1,443,966, Feb. 6. In an app. for handling bricks and other articles piled in stacks, a receptacle constituting a carrier, having a front opening to receive and discharge the stack as a unit, releasable means for closing said front opening to confine the articles in the carrier during transportation, means associated with the bottom of the carrier to support the articles in the carrier but permitting the carrier to be loaded by horizontal movement over the stack, and a pivoted support for the carrier whereby the carrier may be swung to permit discharge of the articles downwardly by gravity through said front opening.



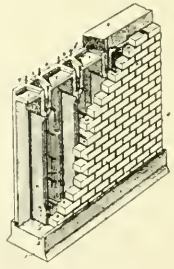
40. Brick. RICHARD BLAIR COOPER. U. S. 1,444,167, Feb. 6. A channel brick of the kind described, comprising a plurality of wall sections and a central area connecting the same together, mortar grooves in each wall section, and an overhanging finger grip on the inner edge of each wall section to constitute an eccentric handhold for the brick.



41. Building construction. ARTHUR W. KRUSEE. U. S. 1,447,868, Mar. 6. A building of the class described having its walls formed of a double row of slabs spaced apart to form an air space, each slab having recesses in its side edges, reinforcing means passing through the slabs and projecting into the recesses, metal strips bridging the space between the rows and having their ends located in the recesses, means for connecting the strips and the reinforcing members together in the recesses and a cement filling in said recesses enclosing the connected ends of the strips and reinforcing members.



42. Wall construction. EDWARD F. NEEDHAM and THOMAS H. NEEDHAM. U. S. 1,448,078, Mar. 13. A wall construction including adjacent wall slabs, the edges of said slabs being formed with ribs which extend at approx. right angles to the face of the slabs, the ribs of the adjacent edges of adjoining slabs fitting together and the upper ends of said adjacent ribs being spaced apart to form a recess between them, a transverse web connecting the upper ends of the edge ribs of the respective slabs, and an outer veneering for the wall.



43. Brick-surfacing machine. JACOB STOCKE, JR. U. S. 1,451,187, Mar. 10. A brick surfacing machine comprising a brick press having a ram, a table secured to said press, strips secured to said table, cutters secured in one of said strips and extending

therefrom, a movable end scoring blade adapted to be moved across the ends of a brick by the downward movement of the ram.

44. Brick kiln and method of setting and burning. William J. Sullivan. U. S. 1,444,220, Feb. 6. That improvement in the art of burning brick which consists in building a kiln with relatively narrow arches and substantially twice the number heretofore employed, supplying heat to each arch in desired amount to bring the kiln to initial temp., then reducing the heat in each arch to prevent overburning of the arch brick and maintaining said reduced heat until the burning is completed.

45. Brick and tile machine. Roy H. McElroy, Joseph D. Cite and Albert G. Langenkamp. U. S. 1,450,506, Mar. 17. In a machine for extruding plastic material a base casting consisting of a base member, an extruding casting member, a gear and shafting supporting member, and an outboard casting member all of said members integral with one another in a single casting, and reinforcing means consisting of dividing walls cast integral with said several members and the base member for maintaining the several parts together as a unit and reinforcing them, and an auger working in said extruding casting.

46. Brickmaking apparatus. Henry W. B. Graham. U. S. 1,452,152, Mar. 17. In app. of the class described, the combination with a brick machine having a filling station and a mold push out, of means for moving empty molds into position for feeding to said filling station, said means including a swingable receiver adapted to support a mold in position for engagement by said push-out. In a brick making machine, the combination of a pair of supports correlated to support molds and permit movement thereof from one support to the other, means for moving molds from one support to the other, one of said supports being pivoted whereby it may be moved to form a gap between them, and means for operating said pivoted support about its pivot to permit the delivery of a mold through the gap and the positioning of the mold on one of said supports.

Refractories

46a. Bauxite (France). Anon. *Chem. Trade Jour. and Chem. Eng.*, **72**, 668 (1923).—Fr. is now the predominant producer of bauxite in Europe and the principal producer of the world before the war, her output of 309,000 T being $^3/_5$ of the world's output; is now 2nd to the U. S., Ark. showing the most notable increase. O. P. R. O.

47. Keramite bricks. Anon. *Süddeutsche Tonind., Brit. Clayworker*, **32**, 17–18 (1923). A number of works have been engaged for some time in Switzerland, Sweden, Austria and Hungary producing Keramite brick. These brick are very hard and strong. The body consists of a well-ground clay and quartz sand, or some similar material. The clay serves as a bonding and sintering medium, while the sand serves to raise the melting point. Clay and sand are mixed together dry, whereupon 6 to 8% water is added to enable the mixture to be dry pressed. The brick are then pressed with 250 atmos. These brick are often fired at cone 13. In Hungary, Keramite brick have long been in use as a paving material and have proved exceptionally durable. They have a mean compression strength of 64,000 lbs. per sq. in. The paving blocks are usually made of the following dimensions: $11^1/_2$" by 4" by $2^1/_2$" to 3". They consist of 54 SiO_2, 14 Al_2O_3, 8 Fe_2O_3, 16 CaO and 4 to 5 MgO. Owing to the high CaO content the Budapest brick are yellowish green in color. H. G. S.

48. Rammed linings replace bricks. Anon. *Brit. Clayworker*, **37**, 17(1923).—Owing to the high price of fire brick, the use of rammed lining of ganister or silica rock is becoming popular. It is true that bricks cannot be dispensed with in some types of furnaces, but the number which might use rammed linings is very large. Steel furnaces, cupolas used in foundries, calcining furnaces, lime kilns, vertical cement kilns, and many

reverberatory may use rammed linings. About 20,000 tons of ganister are used each month in Germany for this purpose. The material employed is an almost pure silica rock which is crushed to powder, mixed with about 2% of CaO, and then ground into a stiff paste with water. The furnace is fitted with adjustable lining rings or with blocks, which are placed so as to act as one side of a mold, while the fur. wall acts as the other side. The space between them is filled with the paste which is then rammed or tamped into position. When the lining is completed, the rings or blocks are removed, and the furnace is "dried out" in the usual manner. No fire brick or blocks are used at all, and the experience of 4 yrs. of this practice has shown it to be highly economical. The results obtained have proved so good that the near future may see the discarding of most of the bricks and blocks now used. Patching is done after every heat, and a relining is not necessary within 2 yrs. H. G. S.

49. Carbonized brick. W. Smith. *Brit. Clayworker*, **32**, 17(1923).—Carbonized brick are produced by treating clay with carbon-charged gases, being different from brick made with a mixture of C and clay. Carbonized clay falls into two groups, i. e., black and white, the former providing a material adapted for heat resistance in reducing atmos., while the latter should be used in furnaces where air is freely admitted. As a heat conductor, the clay should be used in the black condition, as a non-conductor, in the white. Carbonized clay is recommended for filter beds, and the production of high-class acid-resisting ware, while its hardness is just short of SiC. The carbonized brick conducts with twice the efficiency of the standard fire brick. Attention is drawn to the possibility of liberating Fe_2O_3 from red clays by this process. Alkalies may also be liberated from clay by this process. See *Ceram. Abs.*, **2** [5], 101(1923). H. G. S.

PATENTS

50. Manufacture of self-hardening refractory articles. William A. France. U. S. 1,451,540, Apr. 10. The method of manufacturing refractory articles, such as furnace-lining bricks, which consists in mixing magnesite with other elements including magnesium chloride in a molten condition, forming the same, and finishing the resultant by subjecting it to the drying action of air and without burning.

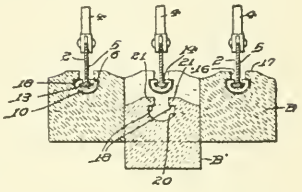
51. Refractory article and method of making the same. Frank B. Danehower. U. S. 1,450,140, Mar. 27. A refractory article of manuf. being a baked product and comprising a comminuted refractory body and the residue of decomposition of synthetic phenol resin which acts as a bond for the comminuted refractory body.

52. Method of molding brick shapes. Charles L. Norton. U. S. 1,444,519, Feb. 6. In the designated method of molding brick-shapes of granular non-plastic material, accumulating a mold charge at a height above a mold, and simultaneously depriving said charge substantially in its entirety of both vertical and lateral support.

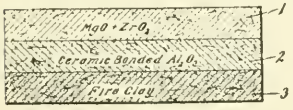
53. Furnace. Perry R. Cassidy. U. S. 1,448,194. A stationary substantially horizontal fur. or oven comprising a stable continuous curved inner wall of refractory material under compression, and an outer metal shell surrounding the same for maintaining the inner wall under compression and resisting stresses due to expansion thereof the metal shell being provided with a slip joint and means for maintaining the same under constant tension.

54. Fire arch for furnaces. Ernst Emil Frozeth and Terry Blixt. U. S. 1,452,295, Mar. 17. A fire arch of the class described consisting of a number of suspension blocks, the same being widest at their lower ends and arranged so as to form with their lower ends the entire under side of the arch, means for hanging the suspension blocks in a boiler or furnace, and a number of downwardly tapered wedge blocks adapted to be inserted and substantially fill the space in between the suspension blocks above said lower ends.

55. Suspended furnace roof. WILLIAM C. STRIPE. U. S. 1,448,879, Mar. 20. In a structure of the class described, the combination of a hanger beam having an enlarged lower portion, means slidable on said beam and adapted to engage said portion to receive support therefrom and a brick having an under-cut slot adapted to receive said slidable means when moved into said slot from either end thereof, the overhanging portions of the brick adjacent the slot operating to retain said means from vertical displacement therein.



56. Laminated superrefractory article. MILTON F. BEECHER and MACDONALD C. BOOZE. U. S. 1,448,684, Mar. 20. A laminated refractory article having a facing of bonded refractory material, a reinforcing backing layer of ceram. material which is reactive with an ingredient of the facing, and a neutral intermediate layer intimately joined to and separating the facing and backing layers.



Terra Cotta

57. The effect of nickel salts on the color. G. M. TUCKER. *N. J. Ceramist*, 1 [4], 268(1921).—Four calcines were prepd. as follows:

A	1 Part Salt 5 Parts Flint	B	1 Part Salt 2½ Parts Zinc 2½ Parts Flint
C	1 Part Salt 2½ Parts Whiting 2½ Parts Flint	D	1 Part Salt 2½ Parts Calcined Magnesite 2½ Parts Flint

In each of these calcines the following were substituted successively for the "salt:"

1—Nickel	7—Nickel formate
2—Basic nickel carbonate	8—Nickel borate
3—Nickelic hydrate	9—Nickel sulphate
4—Nickel hydrate	10—Nickel silicate
5—Nickel nitrate	11—Nickel oxide green
6—Nickel chloride	12—Nickel oxide black

These calcines were ground dry and burned to cone 5½ in a commercial terra cotta kiln, reground and washed. 5% of each calcine was substituted successively in each of the two glazes. One glaze contd. cornwall stone, high content of CaO and no zinc. The other glaze was of the bristol type. Colors obtained varied throughout a considerable range which is given in detail. It appears that magnesium oxide in calcine D exerted greater influence on color than the nickel itself when used in the bristol glaze.

C. W. P.

58. An unusual experience with flat roofing tiles. ANON. *Brit. Clayworker*, 32, 18(1923).—Tile fired in Hoffman kilns had the ordinary "porous" body, yet both surfaces had cracks with a distinctly vitrified, glassy appearance. The following explanation was given. During firing, certain physical and pyrochemical changes occur in the body of the tile. Firing to maturity produces, in the main, a softening of the mol. composing the mass. In this condition, which precedes actual melting, the adhesive force acting between the mol. is practically suspended. If, at this point, a cold current of air comes into contact with a portion of the tile causing local shrinkage, a crack is

the result; but since the individual mol. in this condition possesses no cohesion, the resulting fracture appears smooth. The conclusion to be drawn from these considerations is that any abrupt cooling of the tiles, while at the high temp. must be avoided.

H. G. S.

59. Slip glazed ware. ANT. HÜTTL. *Keram. Rundschau*, **31**, 89(1923).—Brown ware is made in many portions of Germany. The appearance of this ware varies in different localities depending upon the nature of raw materials necessary to make this glaze. Many clays can be used in their natural state to produce glazes if fired sufficiently high but fluxes are usually added to reduce their maturing temp. The analyses of a slip glaze is as follows: SiO_2 = 59.10%, Al_2O_3 = 11.72, Fe_2O_3 = 4.16%, CaO = 7.46%, MgO = 1.84%, K_2O = 4.83%, CO_2 = 6.09% and loss on ignit. = 4.80% which corresponds to the following formula:

$$10.04\ SiO_2,\ 0.136\ Al_2O_3 \left\{ \begin{array}{l} 0.029\ FeO \\ 0.095\ CaO \\ 0.049\ MgO \\ 0.051\ K_2O \end{array} \right.$$

Slip glazes are cheaper than artificial glazes. The Na in wood ashes is often dissolved in water and this soln. is mixed with the glaze having the proper consistency. The Na thus introduced lowers the maturing temp. and improves the quality of the glaze.

H. G. S.

PATENTS

60. Porcelain having the appearance of granite. TOMOTARO KAWAMOTO AND GOSUKE KATO. Japan. 40,582, Nov. 29, 1921. A mixt. of feldspar 50, silica 20, marble 20, clay 10, and limestone 5 parts is crushed, passed through a sieve having 15–20 mesh per 3 cm. and mixed with coarse granules of granite. The mixt. is molded under 40 lb. pressure and heated at 1300° for 10 hrs. (*C. A.*)

61. Purification of gypsum. SHOTARO FUKATA. Japan. 40,417, Oct. 25, 1921. Impure waste or pptd. gypsum (1 part) is burned at 128–190° until the H_2O content becomes less than half a mol. for 1 mol. of gypsum and then powdered. About $^1/_{10}$ part of H_2SO_4 (65° Bé.) is dild. with 20–30 parts of H_2O and heated at about 100°; the powdered gypsum is gradually added and agitated. Monoclinic crystals gradually develop. When the crystn. is completed, the product is sepd. from the acid, washed with H_2O and dried below 60°. (*C. A.*)

Whiteware

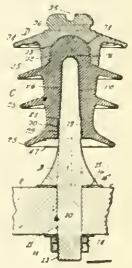
62. Some notes on materials and processes in electrical porcelain manufacture. T. A. KLINEFELTER. *N. J. Ceramist*, **1** [4], (1921).—A somewhat detailed discussion of the processes employed in the manufacture of both high and low tension elec. porcelain together with some remarks upon the phys. properties of the burned wares. C. W. P.

PATENTS

63. Tool for decorating crockery. HYMAN KISSNER and DAVID BLUM. U. S. 1,445,627, Feb. 20. A tool for decorating crockery comprising a wheel of resilient material having a bevel peripheral face, a separate design strip secured on the bevel face, and a suitable mounting for the wheel for operating the same.

64. Insulator. LOUIS STEINBERGER. U. S. 1,446,135, Feb. 20. An insulator and supporting pin therefor, said insulator having a bore extending thereinto from the lower side or end thereof, the pin fitting and extending into end bore, said bore and pin having their adjacent surfaces smooth and free from protuberances or projection throughout the upper and greater

portion of their extent, mutually engaging securing means between the insulator and the supporting pin, said securing means located only at the lower end or side of the insulator and remote from the apex of the pin, and a seat for the line wire on the upper end or side of the insulator remote from said securing means.



Equipment and Apparatus

65. Heating electric steel furnaces. M. Gillot and V. Guillermin. *Rev. ind. minerale*, **1**, 249–57(1921); *Rev. metal.*, **18**, 590.—Furnaces give the best results with a surface of bath not over 1.20 m.^{2} per electrode for small furnaces and 1.80 m.^{2} for 15-ton furnaces. The output per electrode should be not over 3–4 amp. per cm.^{2} for carbon and 12 for graphite. Various little known methods are described for economizing heat by prevention of leakage, better conduction and convection within the furnace, and construction of electrodes. C. C. D. (*C. A.*)

66. Some developments in gas producers. T. R. Wollaston. *Iron Coal Trades Rev.*, **106**, 196(1923).—Results obtained from gas producers of the recovery and non-recovery type are compared with those from an improved plant. Diagrams indicate the sources of loss and inefficiency as compared with the new plant; these are expressed in B. t. u. and money value. The R-G plant which furnished the data has a producer 9 ft. in diam. of 1300 lb. capacity per hr. The fuel is introduced through a retort in contact with hot exit gases and is thus partly coked, while the gases are enriched. The steam for the process is raised in an annular boiler around the unlined producer body. Blast satn. and superheat are derived from a central cone-shaped boiler within the producer which acts as a flash boiler. The precoking leads to a wide extension of the range of common fuels available, to practical elimination of clinkering, to great ease and economy of working, and to the production of a gas of unusually high value, CO_2 10.6%, CO 18.8, H_2 24.4, CH_4 3.9, total combustible 45.1, heating value range 164.5 to 182.5 B. t. u. J. L. W. (*C. A.*)

67. Calite, a new alloy resistant to high temperatures. J. Gaillard. *Usine*, June 17, **1922**; *Rev. universelle mines*, **16**, 317–8(1923).—Calite is an Al-Ni-Fe alloy made in a basic Heroult elec. furnace by fusing and decarbonizing scrap steel, removing the dross, adding Ni, reducing the melt and adding approx. 25% of scrap calite by wt. to the charge. When homogeneous, the metal is run into a previously heated receptacle contg. the requisite amt. of Al, and from this to the molds. It is hard, and either hot or cold is highly resistant to shock. It is not oxidized below 1300°, can be used indefinitely at 1200°, is easily sol. in 25% H_2SO_4, is insol. in HNO_3, is very slowly dissolved by HCl, is not attacked by fused carbonates, chlorides, nitrates, cyanides, Pb, Zn, Sn, S and S vapor, but is attacked by cryolites, borates and silicates. It melts at 1525°, softens at 1370°, can be worked at 1200–1300°, has d. 7.07, Brinnel hardness after annealing 286, hardness by the scleroscope after annealing 40, thermal cond. 25% that of Fe, tensile strength 25.8 kg. per mm.^{2} The % compn. is not given. C. C. D. (*C. A.*)

68. Relation between current, voltage, and the length of carbon arcs. A. E. R. Westman. *Trans. Am. Electrochem. Soc.*, **43**, preprint (May, 1923). C. H. E. (*C. A.*)

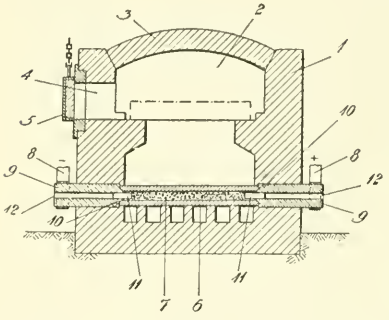
PATENTS

69. Rapid decorating firing furnace or kiln. Ransom W. Davenport. U. S. 1,451,815, Mar. 17. In a furnace for heat treating bodies, a tubular member for contg. bodies, means for heating the central portion of the wall of the tubular member, a plunger for moving the bodies through the tubular member, and means for directing a chem. reagent through the tubular member.

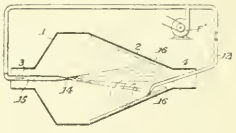
70. Sifting testing machine. Willard J. Bell. U. S. 1,450,166, Mar. 3. In a sifting testing machine, the combination of spaced shaking plates adapted to receive

testing sieves therebetween, a series of connected resilient sieve-engaging arms interposed between said sieves and one of said plates, and a handle on one of said arms adapted to permit such arm to be swung away from said sieves to allow of removal thereof.

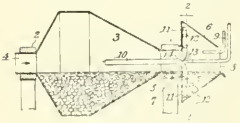
71. Method and device for the heating of material in electric furnaces. Eugen Assar Alexis Grönwall. U. S. 1,450,543, Apr. 3. An elec. fur. comprising refractory pipes, auxiliary resistances of carboniferous material disposed in said pipes, a pair of hollow electrodes in contact with said pipes, and an auxiliary electrode in each of said hollow electrodes and extending into said pipes for ensuring a satisfactory transmission of current from the electrode to said auxiliary resistances.



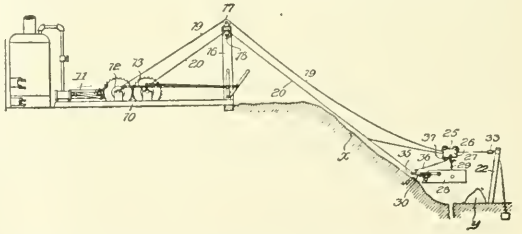
72. Oversize return for mills. Harry W. Hardinge. U. S. 1,450,290, Apr. 3. A grinding mill comprising in combination, a rotatable grinding drum having a substantially unobstructed overflow conical outlet portion for the classification of material according to size, a classifier into which said drum discharges, and means for automatically returning oversize material from said classifier to said drum through the end of said conical outlet portion.



73. Apparatus for entraining and removing fines from conical mills. Harry W. Hardinge. U. S. 1,450,289, Apr. 3. The combination with a conical grinding mill comprising a rotatable drum having a conical outlet portion for automatically classifying material according to size, provided with an outlet opening for discharging the material when ground, of a jet which discharges into said conical outlet portion adjacent the base thereof and directed toward said outlet opening, said jet and conical outlet portion cooperating to form an ejector and means for supplying elastic motive fluid to said jet under pressure.



74. Excavating machine. Milton S. Longnaker. U. S. reissue 15,571, Apr. 3. In app. of the class described, an inclined cable or support, means for slackening and drawing the cable taut to alter its degree of inclination, a movable carriage arranged to travel on the inclined cable and movable thereon in one direction by gravity, a pivotally hung load conveying device suspended from said carriage for free pivotal movement, and an operating cable connected to said conveying device and arranged to haul the same in the opposite direction.



75. Press for forming briquettes. Jean Réol. U. S. 1,454,906, May 15. A double compression press comprising a fixed support, a rotary mold table, an operating lever pivoted on said support, a compression plunger pivotally connected to the operating lever, an ejector plunger also pivotally connected to said lever, a second compression

plunger arranged to move in the opposite direction to the first, a rod and lever connecting the second compression plunger to the operating lever, a hydraulic cylinder, a piston therein, a block carried by said piston, the said connecting lever being arranged on said block, and a rotary cam arranged to impart max. speed to the table during the periods between compression and to hold the table against movement during the periods of compression.

76. Separator. THOMAS J. STURTEVANT. U. S. 1,454,140, May 8. A separator for grading materials, comprising, in combination, a screen, a support therefor beneath the screen, and means for vibrating said support and screen including an eccentric mechanism connected to said support and having minute eccentricity and rotatable at high speed, said screen being unattached to said support, that it may float and tremble on the support with independent vibrations.

77. Shale planer. JOSEPH M. POWELL. U. S. 1,454,519, May 8. A shale planer, comprising a pivot car, a track on which said pivot car is mounted, means for feeding said pivot car forward along said track, a frame pivotally mounted on said pivot car, means in addition to said pivot car for supporting said frame and permitting it to swing about its pivotal mounting on the pivot car, and a perpendicularly extending shale-cutting mechanism carried by said frame.

78. Furnace gas producer. CLIFFORD E. WENTZEL. U. S. 1,455,181, May 15. The combination with a fur. comprising a combustion chamber and an ash pit, of a bed plate interposed between said ash pit and said combustion chamber and having an opening therein, a structure movable into and out of a position to close said opening and adapted to support fuel and ashes in said combustion chamber, and a tuyere supported by said bed plate, extending across said opening and having outlets arranged to discharge into the fuel and ashes on said movable structure.

Chemistry and Physics

79. Physics in the ceramic industries. J. W. MELLOR. *Inst. Physics*, May 9 1923.—The specific applications of sound, light, heat, electricity and magnetism, and mechanical science in the manuf. of pottery and glassware, demonstrating that physical principles can render great service to the ceramic industries. Fire brick are actually rejected when they do not give a sonorous ring; yet silica brick, made with calcined quartz, are not inferior in spite of their leaden ring. Light, copper-blue glazes can be matched in artificial light, but cobalt and chrome colors cannot. If the absorption spectra of metallic oxides had been better known, certain troubles would not have arisen with cobalt-blue lamp bulbs during the war; the reddish glow of these lamps can be cured by the addition of chromic oxide, but not by copper oxide. The changes of quartz into α and β tridymite and cristobalite observed by the detn. of the refractive indices, are not approved by some silica brick-makers. Others look to X-ray examn. for further help. Iron particles are removed from clay by magnetic separators, but the problem of the sepn. of cupriferous pyrites by electromagnetic or electrostatic methods remains unsolved. The processes of firing ordinary bricks are efficient; of the fuel spent in firing biscuit-ware only 2% is utilized and improved fur. flues and screens, useful in the early stages of the operations, might be disastrous in the later stages. During the first stages the loss of water and the contraction proceed at the same rate. Later, the contraction ceases, though the loss of water might continue, and contraction strains should be studied apart from thermal strains. The manufacturer should be asked whether special shapes leave a good safety margin in manuf. and use. Circular plaques crack in radial lines, oval plaques in directions toward either focus. When clay passes through a long-nosed pug-mill, a slab cut in the direction of motion has a greater contraction than when taken at right angles thereto. M. had at first thought the wetter

clay accumulated near the axis; but the flat particles seemed to travel broadside, like a coin sinking face downward in water. A bat of clay distorted during drying can be straightened by damping and drying it under pressure; but during the subsequent firing the particles contract again. Elec. fur., invaluable for high-temp. work, are unsatisfactory for pottery firing. Gas and coal firing acts mainly by convection currents, elec. heating by radiation; large electrically-heated chambers might be provided with mechanisms to ensure better gas circulation and convective heating. The many French measurements of the expansion coeff. of glazes and bodies have so far proved of no practical value, not because they are in themselves useless, but because the problems involved are very complex. O. P. R. O.

80. Studies of the clays. II. Centesimal and rational analyses, use of microscope. O. Boudouard and J. Lefranc. *Bull. soc. chim.*, **31**, 1145–52(1922); cf. *Ceram. Abs.*, **2** [5], 110(1923).—The rational analysis of Vogt depends on the facts (1) that clay, kaolin and mica are dissolved by boiling H_2SO_4, but quartz and feldspar are almost unattacked. (2) Boiling NaOH soln. (sp. gr. 1.8) attacks biotite but not muscovite. A centesimal analysis is made and an analysis of the portion extd. by boiling H_2SO_4. From these figures the kaolinite, muscovite, sand, H_2O and undetd. constituents are deduced. It is shown that the results of the rational analysis may be deduced from the centesimal analysis by ordinary methods of chem. calcn. Microscopic examn. greatly aids in the lithologic interpretation of the centesimal analysis. L. W. R. (*C. A.*)

81. The dissociation of calcium sulfate at higher temperatures. P. P. Budnikov and J. K. Syrkin. *Chem.-Ztg.*, **47**, 22(1923).—Dissociation begins in the neighborhood of 800°. At 1375° the dissociation pressure apparently reaches 1 atm.; melting occurs simultaneously. The decompn. products are CaO and SO_3. The results of the analysis upon the former and the differences in weight, upon heating, are given. Heating to 1000° as in the formation of *Keene's cement* produces only a small quantity (about 3.2%) of CaO. H. C. P. (*C. A.*)

82. A new viscosimeter. P. Lecompte du Noüy. *J. Gen. Physiol.*, **5**, 429–40 (1923).—This app. utilizes the principle of coaxial cylinders. An outer cylinder contg. the liquid rotates around a plunger immersed in the liquid. There is a direct proportionality between the torque due to the friction exerted by the liquid on the plunger when the outer cylinder is rotating and the rate of rotation. The readings are, therefore, proportional to the rate. The app. is particularly adapted to the measurement of colloidal and physiol. solns. Less than 1 cc. of liquid is required for a measurement. Other advantages are: Rapidity of operation (30 sec. to 1 min. for a reading), accurate temp. control, large range and ease of changing the range, great sensitivity. It can be used as a recording viscosimeter. C. H. R. (*C. A.*)

83. The development of mineralogical methods. T. L. Walker. *Am. Mineral.*, **8**, 41–6(1923).—Presented chronologically, the methods which have been developed for mineralogical research and description are: the Wernerian (use of the more obvious phys. properties); geometrical (crystal form) ; chem.; petrographic (microscopic study of transparent minerals); synthetic (artificial production of minerals); mineralographic (microscopic study of opaque minerals); and the method of Friedel and Laue (X-ray detn. of cryst. structure). E. F. H. (*C. A.*)

PATENTS

84. Method of recovering vanadium from its ores. Philip Aleander Mackay. U. S. 1,450,507, Apr. 3. A method of recovering vanadium pentoxide from the other oxides combined with it in vanadium ores, particularly lead oxide, by subjecting the ore to the action of oleum at a suitable temp., reducing the vanadium pentoxide to vanadium tetroxide, in order to obtain vanadyl sulphate, and subsequently diluting the soln. with water to ppt. the insol. constituents of the ore and to leave the vanadium in soln.

85. Reduction of oxides of metals of the chromium group. Richard Edgar Pearson and Eustace Neville Craig. U. S. 1,448,036, Mar. 13. A process for the reduction to lower oxide of the tri-oxide of a "chromium-group" metal which consists in immersing a cathode in an intimate pasty mixt. of the powdered oxide and an electrolyte in which it is insol. and passing a direct current through the mixture.

86. Process for the manufacture of borax and boric acid. Andrew Kelly. U. S. 1,450,975, Apr. 10. A process for the manuf. of borax characterized by treating sodium pentaborate by adding thereto a sodium salt and ammonia.

87. Process of producing zirconium dioxide. Otto Ruff. U. S. 1,454,564, May 8. A process of treating zirconium ores, which comprises strongly heating the ore with a carbonate of an alkali metal, the mixture contg. for each mol. equiv. of zirconium oxide about .75 to 2 mol. equiv. of said carbonate, and for each mol. equiv. of alumina and silica, about 1 to 1.5 mol. equiv. of said carbonate, and thereafter dissolving the water insol. zirconium compds. in an acid.

88. Method of separating zircon from undesired substances. Louis E. Barton and Charles J. Kinzie. U. S. 1,451,004, Apr. 10. The method of treating ores contg. zircon and therewith entangled undesired substances which comprises commingling therewith an alkali metal bisulphate, heating the charge, livixiating the resulting product, and sepg. its liquids from its zircon residuum.

89. Method for making plastic gypsum. Robert E. Haire. U. S. 1,457,161, May 29. The herein described method of making plastic gypsum, consisting in passing calcined gypsum through a tube mill with substantial exclusion of air in circulation through said mill to thereby prevent loss of the water content during the grinding, the material being allowed to discharge at the periphery of the mill when the desired degree of plasticity is reached.

90. Process of producing magnesium nitrate. Victor Moritz Goldschmidt. U. S. 1,454,583, May 8. A process of producing magnesium nitrate which comprises treating olivine and serpentine with nitric acid of 25–40% at a temp. of 50–90°C, whereby the silicic acid is pptd. in an easily filterable state.

91. Process of making sodium-silico fluoride. Henry Howard. U. S. 1,456,594, May 29. Process of making alkali silico fluorides which comprises acidulating phosphate rock with sulphuric acid, sepg. the resulting solution from insol. material, adding to the soln. an alkali in quantity insufficient to convert the phosphoric acid in the soln. to the mono alkali salt, and recovering the resulting precipitate of alkali silico fluoride.

General

92. New Jersey's part in the ceramic history of America. LeRoy H. Minton. *The Ceramist*, 2 [4], (1922–23).—A sketch of the historical development of the ceramic industry in New Jersey, together with statistical information regarding the production of various kinds of wares. C. W. Parmelee

93. The hardening and the speed of solution of calcined gypsum. P. P. Budnikov and J. K. Syrkin. *Z. anorg. allgem. Chem.*, **125**, 257–68(1922).—A study of (1) the rate of soln. of gypsum calcined at temps. from 100 to 800°, (2) the role of the insol. form in retarding the hardening and (3) the peculiarities of the crystn. process. All samples were heated from 5 to 8 hrs., cooled rapidly, ground fine and 2 g. digested in a const. vol. of H_2O at 20°. A definite procedure was used since the soly. may vary up to 20%, depending upon the size of particle (cf. *Z. physikal. Chem.* **37**, 385). Gypsum calcined at 115–25° was composed chiefly of $CaSO_4.\frac{1}{2}H_2O$ and rapidly formed a strongly supersatd. soln., based on $CaSO_4.2H_2O$. The soly. then decreased to a soln. only slightly supersatd. The existence of a soln. satd. with respect to $CaSO_4.\frac{1}{2}H_2O$ could not be verified, indicating that the rate of crystn. of $CaSO_4.2\frac{1}{2}H_2O$ was approx. the same as

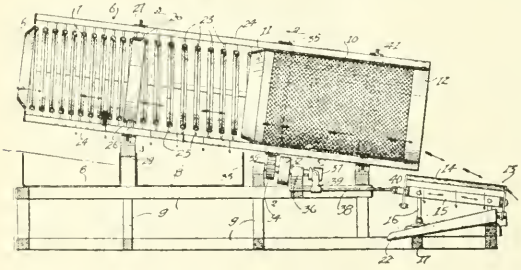
the rate of soln. of the hemihydrate, though the rate of crystn. exceeded that of the soln. of the hemihydrate, preventing the existence of a hemihydrate soln. Calcined at higher temps., soln. took place rapidly and then ceased, with no max. supersatn. or subsequent decrease in soly. as with calcination at 120°. A great difference was found between the products calcined at 400° and 500°. With the 400° product, supersatn. and hardening still took place, but with the 500° product, a normal satd. $CaSO_4$. $2H_2O$ soln. existed after 8 hrs. (cf. Glasenapp, *Studien über Stuckgips, totgebrannten und Estrichgips*, Riga, 1908). If hardening were a result solely of the pptn. of dihydrate, dead-burnt gypsum would not harden, but since it does set slowly, a transformation of the insol. form of $CaSO_4$ to the sol. form must occur. Though boiling ordinarily reduces the ability of gypsum to form supersatd. solns., it had the opposite effect on that calcined above 400°, the rate of transformation to sol. $CaSO_4$ being accelerated. Calcined from 500 to 800°, gypsum showed a much retarded rate of soln. At first it dissolved rapidly until all the sol. form of anhydrous $CaSO_4$ was in soln., after which the insol. form of anhydrous sulfate (the chief constituent) passed into soln. extremely slowly only after transformation to the sol. form. Dead-burnt gypsum contains considerable amts. of sol. anhydrous sulfate and its inability to harden is due to a phys. retardation by the insol. form. A sharp transition temp. of calcination from hardening to non-hardening properties could not be detd., though with rise in temp. of calcination the soly. decreased progressively and hardening was retarded; this was probably due to increasing proportions of the insol. form of anhydrous $CaSO_4$. See also *Ceram. Abs.*, **2** [6], 121(1923). C. C. D. (*C. A.*)

PATENTS

94. Treatment of clay. William Feldenheimer and Walter William Plowman. U. S. 1,447,973, Mar. 20. In the treatment of clay, the step consisting in effecting deflocculation of the clay by admixing the latter with an aqueous soln. of a resin in an alk. solvent therefor. See *Ceram. Abs.*, **2** [6], 138(1923).

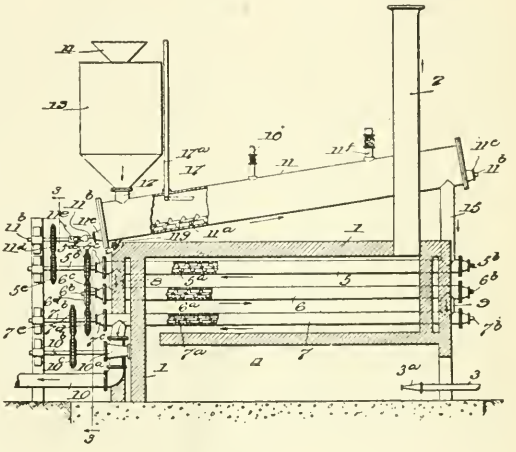
95. Composition of matter for cleaning crystal and glassware. Julia Etta Grover U. S. 1,449,281, Mar. 13. A compn. of matter for cleaning glass and chinaware, formed by mixing and boiling substantially sal soda, borax, sulphur, oil of citronella, alum, chlorinated lime, glycerine and water.

96. Apparatus and method for sampling ores. Fred Mason Martin. U. S. 1,488,758. In the art of obtaining samples of a sticky material, the method which consists in causing a mass of the material to move continuously in a compact stream of substantially equal cross-sectional area thereby to insure the passage per unit of time of equal amounts of the material, causing said stream to fall freely in air disintegrating said compact stream while falling freely and unrestrained, periodically removing from equally spaced apart portions of said uniform disintegrated stream, a relatively small amt. of the material and assembling all of said small amt. removed from the stream to form a fair sample of the whole mass.



97. Grading apparatus. Jay W. Ellenwood. U. S. 1,450,145, Mar. 27. In an app. of the character described, the combination of a revolving inclined cylinder having an open receiving and discharging end, supporting means for said cylinder, means for rotating said cylinder, a coil mounted within said cylinder, said coil being

formed of material having a triangular cross-section with one of the apexes directed toward the interior of said coil, the convolution of said coil increasing in spaced relation one to the other from the receiving end toward the discharging end, a screen adapted to receive material from said coil and discharge said material at its opposite end, a riddle comprising a reciprocating frame, a series of spaced parallel ribs mounted thereon, a central bar rigidly supported on said frame, the other of said bars being pivotally attached to said frame, means for adjusting said bars with respect to each other and means for reciprocating said frame simultaneously with the rotation of said cylinder and coil.



98. Apparatus for the combined solvent and destructive distillation treatment of shale. David T. Day. U. S. 1,447,296, Mar. 6. App. for extracting hydrocarbon oil material from oil bearing shales which app. comprises retort means for distilling shale, a treatment chamber capable of holding a bath of oil and having an opening for the introduction of fresh shale, a shale discharge opening for the discharge of treated shale, a discharge opening for the aeriform material produced, and an opening for the discharge of extracted oil material, means for removing shale from said chamber and passing it to said shale discharge opening, and a pipe directly connecting said chamber and said retort for conducting directly into said chamber material distilled from shale in said retort.

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Vol. 2 | September, 1923 | No. 9

Author Index[1] to Abstracts for September

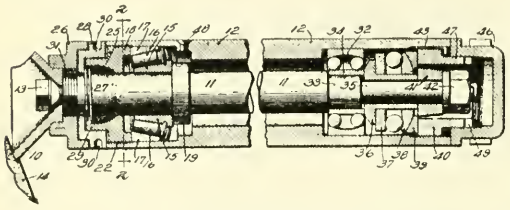
Author	Number of abstract
Addenbrooke, G. L.	5
Andersen, O.	27
Anon	2, 4, 8, 22, 80, 98
Anthony, A. R.	45
Appert, L.	6
Atkins, F. J.	46
Austin, A. O.	31
Bain, G. W.	85
Barta, R.	11
Bertrand, L.	90
Bigot	89
Binns, C. F.	83
Bone, W. A.	81
Brace, P. H.	47
Brown, F. H.	82
Carpenter, C. H.	48
Castelli, G.	94
Chaudron, G. and Garvin, M.	42
Colby, O. A.	67
Collins, H. R.	68
Cottringer, P. and Collings, W. R.	69
Dingledine, H. F.	10
Dyrssen, W.	70
Eckert, F.	17
Eisenmann, J.	19
Fesler, M. A.	71, 72, 73
Foulk, C. W.	37
Fraser, G. H.	50, 51, 52, 53, 54, 55, 56, 57
Gill, G. M.	25
Goddard, W. T.	33
Graham, H. W. B.	13
Harder, O. E.	43
Hase, R.	41
Herman, J.	97
Herschel, W. H.	38
Hirano, K.	30
Holmes, G. E.	103
Hokanson, M.	58, 59
Holtedahl, O. and Andersen, O.	28
Ives, H. E.	60
Keller, H. H.	61
Kirk, C. J. and Brain, G.	34, 35
Klein, A. A. and Beecher, M. F.	36
Kreitzer, H. R.	18
Kroonen, L.	16
Larsson, T.	1
Liptak, M.	14, 15
Little, G. M.	62, 63, 64, 65, 66
Lucchesi, F.	96
Malowan, S. L.	91
Marko, S.	101
McGree, E. C.	26
Meigs, C. C., Bassett, H. P., and Slaughter, G. B.	86
Mennecke, M.	88
Moore, E. T.	24
Northrup, E. F.	95
Norris, P. B.	74
Pike, R. D.	100
Pomeroy, E. H.	102
Pulfrich, M.	21
Quensel, R.	99
Reed, C. J.	75
Reid, T. A.	76, 77
Riddle, F. H.	29
Robinson, A. H. A.	84
Schneider, R.	7
Schriever, W.	40
Sherwood, C. J.	79
von Siemans, H. and Zander, H.	23
Staff Article	9
Stern, E.	39
St. Reiner	92
Tait, W. J.	44
Tammann, G.	93
Thiele, R.	3
Tschoplowity, F.	20
Van Wettenschappen	87
Warren, J. A.	78
Weber, B. F.	12
Weeks, L.	32
Zeh, E. W.	49

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by cooperative agreement.

Abrasives

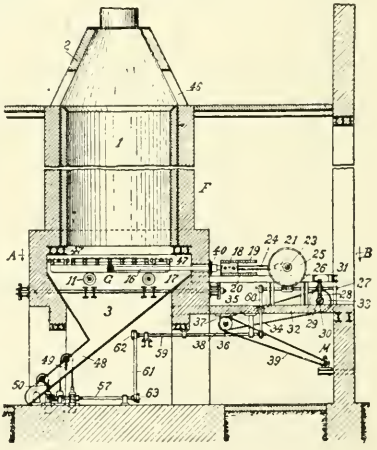
PATENT

1. Dressing tool for grinding wheels. THURE LARSSON. U. S. 1,455,213, May 21. A dressing tool for grinding wheels comprising an open ended housing, a rotatable shaft mounted therein and having one end projecting therefrom, a cutting disk on the projecting end, means to exclude dust from the inside of the housing, adjustable radial bearings within the housing adjacent said projecting end of the shaft, radial bearings for the opposite end of the shaft, adjustable bearings for receiving end thrust only, and means for positively adjusting each set of said adjustable bearings independently of the other set to take up radial and longitudinal wear.



Cement, Lime and Plaster

2. Slump test for concrete. ANON. *Indus. Australian & Mining Standard*, **59**, 757(1923).—In order to standardize mixts. of concrete to a definite specification the "slump" test may be employed. Newly mixed concrete is placed in a mold, and lightly tamped, which when filled is removed immediately and the settlement of the concrete noted. If the slump or settlement is not in accordance with the specifications the amt. of water can be increased or decreased as may be required. For stiff concrete, the slump should not exceed 2″ and concrete of this consistency will require punning. For a concrete which will flow around reinforcement, a slump of 6″ is suitable, and if the reinforcement be intricate, this quantity may be slightly increased. The amount of variation in the quantity of water is not great, and this test is very sensitive and delicate; an increase of 10% in the quantity of water will increase the slump by several inches. The mold is made of metal, in the form of a hollow truncated cone about one foot long, 4″ in diameter at the top, and 8″ in diameter at the base, and provided with handles at the sides. The test can be made in a few minutes, and by its adoption the strength of concrete structures will be more uniform. At the present time expts. are being conducted to develop a method, that will enable the volume of water to be detd. for each given slump. O. P. R. O.



PATENT

3. Continuous furnace for burning cement and the like. RUDOLF THIELE. U. S. 1,451,379. A continuous furnace of the character described, having a shearing-grate consisting of grate-sections adapted to be reciprocated in their own plane in opposite directions to each other, clinker-crushing teeth on said sections and means for reciprocating said grate-sections.

Glass

4. Accurate glass tubes, manufactured by the Küpper process. ANON. *Chem. Age*, **8**, 615(1923).—The Küpper process for the manufacture of glass tubes with absolutely accurate internal diameters was subject of a rept. recently made to the Aix la Chapelle section of the German Chemists. According to the "Küpper" process an accurately cylindrical metal core is inserted into the drawn glass tube; thereupon the tube is evacuated and the outside is slowly heated up. Thus the glass becomes soft and the outer atmospheric pressure forces the walls into intimate contact with the metal core so that the interior of the tube takes exactly the dimensions of the metal core. The glass tube has a higher coeff. of exp. than the metal core: after cooling, therefore, the core can easily be withdrawn from the tube and may be inserted into another tube to be calibrated without any prepn. being required. A great number of tubes made by the Küpper process was presented at the meeting, and it was demonstrated that one metal plunger fitted a number of precision syringes with equal accuracy. O. P. R. O.

5. Electrical properties of flint glass of density 6.01. G. L. ADDENBROOKE. *Phil. Mag.*, **45**, 516–25(1923).—Hopkinson (*Trans. Roy. Soc. London*, **1878**) announced that the ratio K/D is approx. const. for all glasses over a range from $D = 2.87$ to 4.5, where D is density and K is the dielec. const. A. employs a glass of approx. compn.: SiO_2 22%, PbO 78%, and of d. 6.01. Fragments were used employing the method of mixts. Details of the elec. method and the calcn. are given. The very high dielec. const. 13 was obtained, giving a K/D value that fits in well with those of Hopkinson. The ratio K/N^2 (N is the index of refraction of the D line) is 3.55, the highest ever found for any normal substance. The evidence indicates that the glass is a true compd., $PbSiO_3$ dissolved in an excess of SiO_2, and not merely a mixt. of SiO_2 and PbO.
S. C. (*C. A.*)

6. Progress in the glass industry. LEON APPERT. *Bull. soc. encour. ind. nat.*, **134**, 728–65(1923). E. H. (*C. A.*)

7. Gas producer and furnace practice in the glass industry. RICH. SCHNEIDER. *Glashütte*, **52**, 625–7, 641–2, 657–8, 673–6, 689–93, 707–8, 723–4, 755–6, 771–2, 787–8 (1922); 26 figs. J. B. P. (*C. A.*)

Heavy Clay Products

8. Scumming on roofing tile. ANON. *Tonind. Ztg.*, **47**, 272(1923).—Sol. salts in clay cause scumming on roofing tile which has heretofore been prevented by the addn. of $BaCO_3$ to the clay. The price of $BaCO_3$ is, however, becoming so high that many manufs. were forced to abandon the use of this preventative. Some manufs. have succeeded in reducing the amt. of $BaCO_3$ by adding a certain percentage of finely ground sand. This sand is ground to a powder in a ball mill. Since the sand contains practically no sol. salts while the clay does, the amt. of $BaCO_3$ required is reduced in propn. to the amt. of sand added. H. G. SCHURECHT

9. Handling clay with belt conveyors. STAFF ARTICLE. *Brick and Clay Record*, **62**, 1136–7(1923).—Description of the system used for clay storage at Don Valley Brick Co., Toronto, Ont., and diagram of belt conveyors used for carrying ground and unground clay. J. W. H.

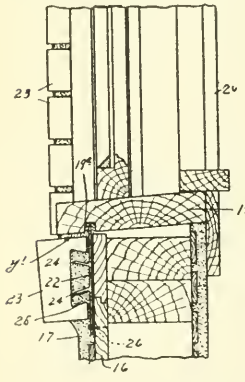
10. Construction and adjustment of dies. H. F. DINGLEDINE. *Brick and Clay Record*, **62**, 1130–1(1923).—Dies for hollow tile may be roughly divided into two classes, flat and tapered. Flat dies are never lubricated and are suitable under certain unusual conditions. Tapered dies may be lubricated with steam, oil or water. Hollow tile dies are of the tapered non-lubricated type. Angle of taper apparently is dependent upon the individual clay. To establish correct angle for a given clay, the most satis-

factory method is to start with a die having a small amt. of taper and then gradually increase the angle of taper to the point where the column speed is at a max. When this angle is passed the column speed diminishes, and when once established it is found to be fairly constant with a given clay for different shapes. However, when building dies, the angle of taper should be somewhat smaller than that found best (1) to allow for future wear (2) since no taper is better than too much taper, as a die with too much taper is more sensitive and more difficult toad just to the slight changes in clay and in tempering, (3) since the remedy involves heavy overhanging baffle plates at the back of the die which slow up the column and disturb the compactness of the clay in the side walls. Light short issue dies cause less trouble, are easier to adjust, lighter to handle and consume far less power. The raw material is the deciding factor. Hard running clays require heavy dies with strong bridges and posts and any increase in thickness of metal back of die serves as a baffle to movement of clay. After the interference back of die is reduced to a min. in shape of bridges and posts, the next step in die design is to distribute the interferenee as evenly as possible to permit uniform flow of clay. Cracking in drier is largely due to bridges being too close to back of die. To overcome this, move bridges back, use softer clay or serrate bottom of bridges. In dies with square corners, it is generally necessary to give areas around corners more clay, because of the great friction at corners of the die. This is accomplished by giving the die slightly more taper around the corner or slightly baffling the straight sides. J. W. H.

11. Brick-making in Czechoslovakia. Rudolf Barta. *Rev. Mat. Constr. Trav. Pub.*, **164**, 88B(1923).—Production amts. to 2,000 million of brick and 200 million of tile per yr. Plastic clays are mixed with sand and water in large cylinders, and then pressed moist. After drying, the brick are burned in continuous kilns of the Kohout-Hoffmann type. L. N.

PATENTS

12. Method of and means for making bricks. Bernard F. Weber. U. S. 1,454,826, May 8. The method of making and assembling bricks which comprises, extruding clay through a die in a parallel-sided stream, assembling slugs of a plurality of brick lengths in parallel relation to each other, and cutting the assembled parallel slugs at right angles into brick lengths.

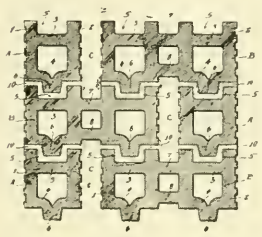


13. Brick machine. Henry W. B. Graham. U. S. 1,454,165, May 8. The combination with means for filling molds with material for making bricks, of mold return means, mechanism for inverting each mold and separating the mold and bricks, and means coöperating with said inverting and separating mechanism to turn the empty mold right side up and deliver it to said return means.

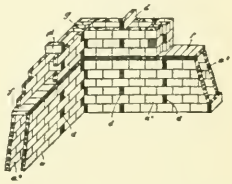
14. Brick trim for walls. Michael Liptak. U. S. 1,454,293, May 8. The combination with a wooden wall having a wooden framed window opening of masonry-faced metallic trimming strips applied around the outer portion of said framework and interlocking therewith and secured to said wall, said wall having a stucco outer covering imbedding portions of the metallic facing strips and united with the masonry facing thereof.

15. Brick-faced metallic trim. Michael Liptak. U. S. 1,454,294, May 8. As a new article of manufacture, a metallic base plate formed with an irregular face, cement interlocked to said base plate, and bricks held in bond by said cement and by the latter indirectly secured to said base plate.

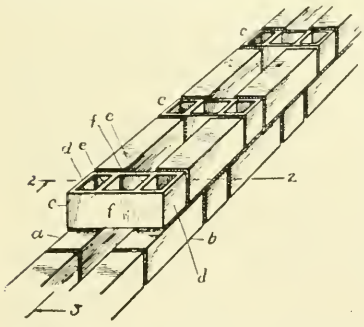
16. Building construction. LEO KROONEN. U. S. 1,451,340, Apr. 10. A wall structure combining a plurality of horizontally disposed interlocking hollow building blocks each having horizontal top and bottom walls and vertical connecting side walls extending above the top wall to form a mortar groove, the bottom wall of each block being formed with a longitudinal tongue vertically aligned with said groove and having converging side walls and positioned and embedded in mortar in the mortar groove of the adjacent block.

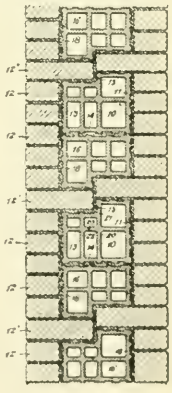


17. Hollow wall. FRITZ ECKERT. U. S. 1,451,439, Apr. 10. A hollow wall of standard bricks wherein there are interposed in the courses formed of stretchers separate bonding bricks in such a manner that the vertical course is interrupted repeatedly and the vertical shaft is shut off at these parts and several complete courses of headers laid flat dividing the whole of the hollow space into horizontal passages.



18. Wall construction. HARRY R. KREITZER. U. S. 1,456,063, May 22. A wall consisting of two parallel courses of wall members spaced apart so as to provide a space of substantial width between the courses, and transverse bonding members connecting said courses, the ends of said bonding members being supported in said courses, said bonding members being made of hollow tile consisting of longitudinal vertical webs, transverse end webs and other transverse webs intermediate the ends, the intermediate webs being supported on the inner-edge portions of said courses, thereby leaving the air space between said courses unobstructed except by the longitudinal webs of said bonding members.





19. Building block and construction. JOHN EISENMANN. U. S. 1,456,373, May 22. A backing or filling block for brick walls, said block having the full width of one bearing side formed in the same plane, and an offset in the other bearing side corresponding to half the depth of one course of the brick.

Refractories

20. Thermal capacity of bricks. F. TSCHOPLOWITY. *Brit. Clayworker*, 32, 91 (1923).—The sp. ht. of poor conductors such as bricks may be detd. without the use of expensive calorimeters as follows: A cylindrical glass tube closed at one end, without any rim and about $1^1/_2$ in. diam. is provided with a rubber stopper about $^1/_2$ in. thick and supports a chem. thermometer, the bulb of which extends to about $^1/_2$ in. from the bottom of the tube. About 80 cc. of water is placed in the tube and the latter, with its contents, is maintained at a convenient temp., by means of a water bath. An accurately weighed amt. of material (reduced to pieces about $^1/_{12}$ in. diam is heated to 100° C, until it has attained this temp. The material is then transferred rapidly to the tube,

and the rise in the temp. of the contents is noted, the tube being kept in the water bath all the time. The temp. of the water bath is gradually increased by the addn. of hot water, so that it becomes nearly the same as the contents of the tube. The sp. ht. is then found from the following formula: $C = W(a-b)/D(e-a)$. Where C = the sp. ht., W = the wt. of water in the tube, a the highest temp. attained by the mixture, b is the temp. of the water before adding the material to be tested, D the wt. of the material, e the temp. of the hot material. Detns. made in this manner show a sp. ht. of 0.216 for fire brick and 0.184 for common brick as compared with 0.23, which figure is generally accepted. H. G. S.

21. Destruction of coke oven walls. M. Pulfrich. *Tonind. Ztg.*, **47**, 271–2 (1923).—Considerable spalling and breaking off of pieces of silica brick were observed in a coke oven wall. This trouble first occurred after the brick had been in service one year. Analyses of the brick showed that they were of high quality and that they had a softening point of cone 35. It was found that the brick was well burned and therefore this trouble could not be attributed to the expansion accompanying the transition of quartz to tridymite. The mortar which had a compn. very similar to the silica brick was next examd. and found to be composed largely of unchanged quartz which was just commencing to change to tridymite. As this change is accompanied by an increase in volume it caused the otherwise stable wall to disintegrate. The selection of a sand of the mortar which is more easily converted to tridymite is suggested as a possible means of overcoming this trouble. H. G. S.

22. Blue mountain refractories. Anon. *Min. Eng. Rec.*, **27**, 78(1923).—Tests made on the clays from the property of these refractories at Whonnock, B. C., show they carry 51.2% aluminum oxide, thus approaching bauxite. These clays are said to be the richest clays in aluminum, known to exist in Canada. O. P. R. O.

23. Preparation of pure zirconium oxide. H. von Siemens and H. Zander. *Wiss. Veröffentl. Siemens-Konzern*, **2**, 484–8(1922).—Brazilian zirconia (67.8% ZrO_2, 22.2% SiO_2, 8.7% Fe_2O_3, TiO_2) mixed with 25% of charcoal was heated at 1000–1200° in a stream of Cl, and the mixt. of chlorides evolved collected in a fireclay vessel. Complete reduction was not effected, only about 80% of the zirconia being reduced. There appeared to be no catalysis due to the presence of Fe and Ti. The phys. condition of the ore appears to play some part in the reduction, as slightly ignited zirconia powder is readily reduced, while powd. sintered fragments are not reduced. The mixt. of chlorides obtained is dissolved in water and the soln. evapd. to incipient crystn. The crystals of $ZrOCl_2$ thus obtained are preferably washed with a mixt. of alc. and concd. HCl in equal proportions, or alternatively, the crystals are slaked with water until completely hydrated and no further evolution of Cl occurs. The hydrated mass is dissolved in the hot alc.-HCl mixt. and the soln. crystd. by cooling. The crystals are ignited in air in order to obtain pure Zr oxide. J. S. C. I.

24. Recent electric-furnace developments. E. T. Moore. *Blast Furnace Steel Plant*, **11**, 153–8(1923); cf. *C. A.*, **16**, 22, 686.—A total of 416 elec. furnaces had been installed or contracted for in the U. S. up to Dec. 1, 1922. There was a tendency toward the use of a greater no. of small furnaces. No appreciable interest in elec. furnaces was indicated among gray or malleable Fe foundries. An installation was made in England for melting and partly refining steel in a 10-ton furnace and then transferring approx. $1/3$ of the molten bath to a $3\,1/2$-ton furnace for finishing. Several elec. and metallurgical advantages are claimed. The same practice has been tried in this country with satisfactory results. The largest elec. arc furnace thus far installed is a 60-ton Greaves-Etchells furnace. This furnace has 2 charging doors on each side, 1 in the rear, and a teeming spout in the front. All doors are operated by air cylinders. Side-wall linings are 18 in. thick; roof brick 12 in. thick. There are eight 24-in. carbon

electrodes. Transformer equipment consists of four 3,000 kv. a. units, primary 4600 v., secondary 90 to 39 v. Among other developments in the general field, the need for improved electrodes has been met by at least one manufacturer by making electrodes of considerably higher density. Reports indicate better performance and less breakage with such electrodes. L. J. (*C. A.*)

25. Use of refractory materials in gas works. G. M. Gill. *Gas World*, **78**, 416–8; *Engineering*, **115**, 696–8(1923).—England possesses a considerable resource in clay which could be employed to produce semi-silica or siliceous refractory materials not having the disadvantages of either fireclay or 95% silica material. Fireclay often shows too much after-contraction and too ready a tendency to soften under load, while 95% silica material as often shows too much after-expansion, necessitating special construction, besides the extra expense of the retorts having to be built up instead of molded, and the objectionable tendency of 95% silica material to spall. There is large opportunity for the production of a much larger quantity of semi-silica or siliceous material with a SiO_2 content of 76 to 92% according to the position in the setting and the purpose for which it is required. The same class of material might also be used with great advantage for producer arches and walls and for the crowns of the arches in horizontal settings. At least 75% of the material required for building modern retort settings should be of a quality showing not more than 1% max. expansion or contraction at 1350° to 1400° under load, the remaining 25% showing not more than 1% max. expansion or contraction at 1280° under load. J. L. W. (*C. A.*)

26. Comparison of the modulus of rupture of silica bricks, hot and cold. E. C. McGree. *Rev. universelle mines*, **17**, 36–7(1923).—The modulus of rupture (under pressure) at 1350° was approx. $^1/_3$ that at ordinary temp. The decrease in transverse resistance to rupture was approx. inversely proportional to increase in temp. and it is possible to est. the modulus of any brick at high temps. from its value at ordinary temp. Very rapid heating to a red heat reduced the modulus disproportionately. C. C. D. (*C. A.*)

27. Physical chemistry of refractory oxides. Olaf Andersen. *Norg. Geol. Undersökelse*, **1**, 55 pp.(1922).—Summary of recent high-temp. investigations of single refractory oxides and of systems contg. several of these oxides as components. A bibliography is given. J. A. A. (*C. A.*)

28. Norwegian dolomite. Utilization of dolomite. Olaf Holtedahl and Olaf Andersen. *Norg. Geol. Undersökelse*, **2**, 49 pp.(1922).—Deposits of fine-grained dolomite occurring in the northern part of Norway are described. Some preliminary expts. on the "burning" of dolomite have been carried out. The heating of this dolomite for 2–5 hrs. at 1400° produced no effective sintering. The structure of the raw dolomite has no great influence on the structure of the burned product, since, within certain limits, the resulting lime and magnesia were always very fine-grained. The sepn. of lime from raw dolomite by elec. sintering or melting is discussed. J. A. A. (*C. A.*)

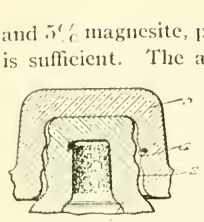
Whiteware

29. The production of porcelain for electrical insulation. F. H. Riddle. *J. Am. Inst. Elec. Eng.*, **42**, 343–6, 540–3(1923).—A history of elec. porcelain. It is defined as "an agglomerate of clay and quartz held together in a matrix of molten feldspar." Some typical analyses of the clays used are given. The phys. properties and functions of the raw materials are reviewed. W. E. R. (*C. A.*)

PATENT

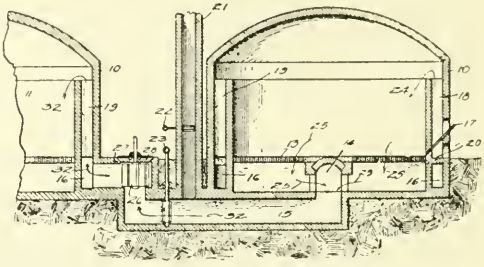
30. Talc porcelain. Kôsuke Hirano. Japan. 40,863, Nov. 30, 1921. A mixt. of 25% talc, 30% talc previously fired at about 1200°, 30% clay or kaolin, 10% feldspar

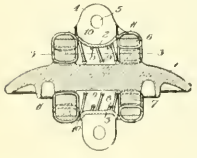
and 5% magnesite, previously fired at 600–1200°, is used. Only one process of heating is sufficient. The addn. of magnesite is specially emphasized. (*C. A.*)



31. Joint for articles of ceramic and similar materials and method of producing same. Arthur O. Austin. U. S. 1,456,960, May 29. In combination, a plurality of ceramic bodies having connection with one another at a plurality of points of limited extent, said bodies being fused to one another at their points of connection to provide a yielding joint. See also *Ceram. Abs.*, **2**,77(1923).

32. System of kilns. Leroy Weeks. U. S. 1,454,358, May 8. A battery of kilns each provided with heating chambers and passageways arranged between the heating chambers and connected together by a subterranean conduit, each of said conduits having an opening in the top wall thereof, a fan element arranged to be selectively and removably received in any one of the conduits between any pair of kilns, so that heated air from one kiln may be drawn into the next adjacent kiln, a bearing member for said fan element arranged to be seated in any of said openings, and when the kiln is at a predetermined heat the fan element and bearing member may be removed for the purposes stated.





33. Insulator. Walter T. Goddard. U. S. 1,454,634, May 8. An insulating unit comprising an element formed of frangible insulating material, a rigid metallic element connected thereto, and means for connecting said elements at a plurality of points and for equalizing the strains imparted from one of said elements to the other, said means involving a continuous flexible sinuous member alternately engaging the said connected elements at a succession of points on each of said elements.

34. Porcelain tank and process of making the same. Charles J. Kirk and George Brain. U. S. 1,449,761, Mar. 27. The process of casting porcelain tanks having corners that comprises pouring liquid slip into a suitable mold, permitting the porcelain to set until the side walls of the tank have solidified, piercing one or more of the corners to permit the escape of unsolidified slip and draining off the unsolidified slip.

35. Process and mold for forming earthenware articles and product thereof. Charles J. Kirk and George Brain. U. S. 1,449,762, Mar. 27. The process of forming a closet of cast earthenware which comprises providing a siphon member forming the top of the discharge arm of the siphon and the bottom of the intake arm of the siphon, the said member having the intake siphon portion supported throughout its length upon said discharge portion by means of a solid web, placing the said siphon member in a mold, forming the exterior of the closet bowl, and casting the said siphon member within the closet.

36. Nonslip tile. Abraham Albert Klein and Milton F. Beecher. U. S. 1,451,462, Apr. 10. A non-slip tile comprising wear-resisting abrasive granular material of a hardness between quartz and crystalline alumina and a ceramic bonding material integrally united by heat into an abrasive, wear-resisting and substantially integral mass in which the granular material constitutes a substantial proportion of the surface

of the tile and the bond is capable of permitting renewal of the safety characteristics of the tread surface.

Equipment and Apparatus

37. A new form of precision hydrometer. C. W. Foulk. *J. Optical Soc. Am.*, **7**, 327–34(1923).—The principle of the app. is that of submerged floating equil., in which an elongated hollow glass or silica bulb is ballasted so that it neither rises nor sinks in a given liquid. One type of app. consists of a tube open at both ends and of the right diam. to allow the float to move freely along its length, the appropriate scale being etched on the side wall of the tube. To the bottom of the float is attached a small chain hanging in a catenary curve between the float and an independent pt. of support. When the app. is put into a liquid the float takes up a position detd. by the d. of the liquid while the suspended chain automatically adjusts the wt. to that d. The effect of various consts. of the above float on response to differences of liquid d. is shown by the equation: $\Delta d = w[(D-d) \times \Delta b]/(2D \times V)$, in which Δd = density change in liquid causing vertical displacement of float of Δb measured in cm., D = density of chain material, d = density of liquid, V = vol. of float in cc. and w = wt. in g. of 2 cm. of chain. The formula shows the sensitiveness of the instrument to be proportional to the vol. of the float and inversely proportional to the wt. of a unit length of chain. Advantages over old types are: more accurate scale reading, absence of troublesome surface phenomena and uniform temp. Some disadvantages are given. H. E. B. (*C. A.*)

38. The improved MacMichael viscosimeter. W. H. Herschel. *J. Optical Soc. Am.*, **7**, 335–53(1923).—The app. is a const.-deflection, torsional instrument, with advantage of speed of operation, and weakness due to variations in torsional resistance of suspending wire. It consists of a torsional pendulum with a bob hanging in the liquid to be tested. On a turntable is an outer cup concentric with the cup holding the test liquid, and the space between contains oil or H_2O with an elec. resistance coil for heating. The turntable moves at const. speed and the pendulum has const. deflection during the test, due to the viscous drag of the liquid. The deflection is read on a horizontal dial concentric with the bob by means of a telescope, and the circumference is divided into 300 equal parts, called the MacMichael degrees. Two bobs are supplied, one similar to the disk formerly used and the other a cylinder 1 cm. in diam. and 4 cm. high. Various methods are described for avoiding end effects, including the use of guard rings on the inner suspended cylinder and trapping of an air bubble under the bob. Turbulence is caused by too wide a clearance and an equation is given for estg. the crit. velocity at which it begins. Imperfect elasticity of the torsional wire is the cause of considerable error and several tables are given showing allowable deflections and variation in torsional modulus of elasticity with diam. of wire. Tables and equations are also given to show the measurement of turning moments on the suspended wires, the variation of dial readings with change of viscosity and wire diam., and detn. of deflection by mirror and scale method. The conclusions reached are, that the wires of the improved MacMichael viscosimeter cannot be calibrated with H_2O because of turbulence, a liquid with viscosity of about 0.5 poise being required. The end effects are negligible compared to errors due to semi-permanent set of the torsion wires. The app. might be greatly improved by measuring the moment due to viscous drag by other means than the torsion wire. H. E. B. (*C. A.*)

39. Viscosimeter. E. Stern. *Chem.-Ztg.*, **47**, 291–2(1923).—The app. is useful in comparison work on *colloids*, such as *varnishes*, solns. of *cellulose*, *rubber adhesives*, etc., as well as in the *oil* industry. It consists of 3 cylindrical glass bulbs, the middle one contg. 75 cc. between marks on the stems joining it to the others. The upper bulb is open at the top while the lower terminates in a tube to which capillary tubes of different

lengths and diams. may be attached in order to change the rate of discharge. A H_2O-jacket is provided for work at const. temp. J. H. M. (*C. A.*)

40. A laboratory optical pyrometer: notes on its design and operation. Wm. Schriever. *Proc. Iowa Acad. Sci.*, **28**, 69–82(1921).—An optical pyrometer suitable for accurate temp. detns. and flexible enough to be of general use in a physical lab. is described with illustrations. A brief sketch of the theory and design of a Holborn-Kurlbaum optical pyrometer is included (cf. *C. A.* **16**, 4097). W. G. G. (*C. A.*)

41. A thermoelement for radiation measurements. Rudolf Hase. *Z. Physik.*, **15**, 52–3(1923).—A short piece of an alloy which will give a very high thermoelec. force is welded to suitable leads and placed in a thin-walled, highly evacuated glass bulb. The black collecting disk is fastened to the "hot junction" and the cold junction is in the shadow of the disk. A novel mounting of the thermoelement and galvanometer cuts out all extraneous radiation and the scale, which is calibrated to read the black-body temp. directly, is illuminated by the radiating body. The instrument is suitable for measuring all temps. above 500°. C. C. V. V. (*C. A.*)

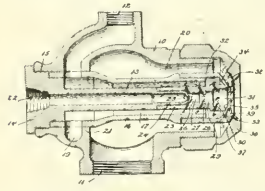
42. Laboratory apparatus for heating at high temperatures. Georges Chaudron and M. Garvin. *Chimie et industrie*, **9**, 647–50(1923).—Brief description of the Tammann, Arsen, and Ruff furnaces. C. and G. designed a vacuum furnace for high temps., consisting essentially in a double-walled metal body in 3 sections: base, contg. suction, gas, electricity and water connections; body proper and cover. Water can be circulated through the 3 portions. Heating is obtained by means of an internally wound W coil, which can be heated 8 times up to 2000° before wearing out. A vacuum of 0.001 mm. can be obtained cold and 0.02 mm. hot. An app. for winding the W coils is described. A. P. C. (*C. A.*)

43. Improvement in crusher steel is suggested by metallographic tests. O. E. Harder. *Eng. Mining J. Press*, **115**, 314–8(1923).—Examn. of failures of mine and mill equipment indicates that sufficient attention is not given to heat-treatment in the process of manuf. V. O. H. (*C. A.*)

44. Safety locking device for filter press. W. J. Tait. *Eng. Mining J.-Press*, **115**, 938(1923).—An illustrated description of a device to prevent opening of a filter press head while under internal pressure. It consists of a diaphragm and plunger operating 2 safety catches held down over the locking yoke. C. C. D. (*C. A.*)

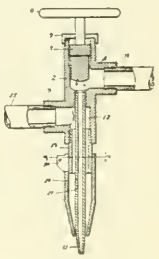
PATENTS

45. Burner. Alfred R. Anthony. U. S. 1,451,063, Apr. 10. An oil burner including in combination, a body, a fuel tube therein said tube having a chamber at its forward end open at the tip of the tube and said tube also having an aperture for discharging a jet into said chamber, the wall of the fuel tube surrounding the chamber having a plurality of series of holes therethrough spaced along the length of the chamber, each series comprising a plurality of holes spaced circumferentially of the wall one series being inclined forwardly toward the axis of the chamber and one series being inclined in a circumferential direction to discharge the air into the chamber with a whirling motion.

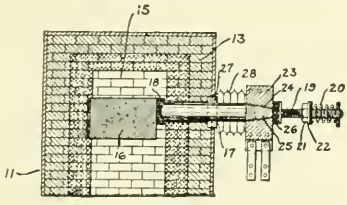


46. Oil burner. Frank J. Atkins. U. S. 1,452,020, Apr. 17. In a burner of the class described, a tubular main body provided with a pair of lateral extensions at opposite sides thereof communicating with its interior, said body having an enlarged chamber at its rear, a valve seated in said chamber, a cap threaded on the valved end of said body, an oil tube extending forwardly and threaded into the burner body and in communication with said chamber, said tube being contracted at its outer end to form a

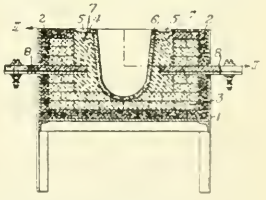
nozzle, said body having an enlarged chamber in front of the connection with the oil tube with the body, said chamber being cut off from communication with the first-mentioned chamber and from the tube, a tubular connecting sleeve threaded into the front end of the second mentioned chamber and encircling the oil nozzle tube, the bore of said connecting member being a larger diameter than the tube providing a chamber communicating with the second mentioned chamber, and a tubular air nozzle adjustably secured around and encircling the oil nozzle tube, said air nozzle being contracted at its front end adjacent the base or inner end of the contracted portion of the oil nozzle, the air nozzle being adjustably mounted on the sleeve connection whereby the outlet end of the air nozzle will at all times be positioned at the rear of the outer end of the oil nozzle.

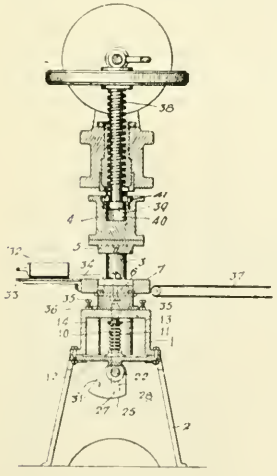


47. Terminal for electric furnaces. PORTER H. BRACE. U. S. 1,456,865. In an electric-resistance furnace, the combination with a movable electrode and a stationary water-cooled collar surrounding said electrode, of a movable water-cooled terminal secured to one end of said electrode and an expansible metal tubular member secured to said collar and said terminal for preventing the escape of a heated fluid leaking past said collar and for equalizing the temperatures of said collar and said terminal.



48. Electric furnace. CRANSTON H. CARPENTER. U. S. 1,444,948. In an elec. furnace, the combination with a refractory casing, of a muffle of refractory electrical-conducting material in said casing, hoppers in said casing on opposite sides of said muffle, solid carbonaceous terminal electrodes extending into said hoppers, and a mass of electrical-conducting granular material in each of said hoppers adapted to electrically connect said electrodes and said muffle and to permit the current to traverse the walls of said muffle, said masses of granular material being in contact with said muffle over a relatively small portion of its surface.





49. Power tile press. EDMUND W. ZEH. U. S. 1,456,752, May 29. In a power tile press, the combination of a lower die to receive the material of which the tile is to be formed, an upper die adapted to coöperate with said lower die to compress the material, operating means for moving the upper die into and out of contact with material in the lower die, and means for enabling successive percutient blows to be struck upon the material while the dies are in contact therewith.

50. Crushing machine. GEORGE HOLT FRASER. U. S. 1,451,149, Apr. 10. In combination, an annular die revolving in an approximately vertical plane and having an internal crushing face, a movable and rotatable crushing roll within and eccentric of said die and having a peripheral crushing face reciprocal to the inner face of said die, means for revolving one of said parts, a

casing supporting said parts, a movable member movably mounted on said casing, non-rotative movable means on which said roll is rotatably mounted and movably mounted on and held outwardly by said movable member, and pressing means opposite and reacting on said movable member and said casing for holding said non-rotative means outwardly to hold said roll outwardly toward the inner face of said die to resist a crushing pressure therefrom.

51. Machine for crushing or grinding. GEORGE H. FRASER. U. S. 1,451,150, Apr. 10.

52. Machine for crushing or grinding. GEORGE H. FRASER. U. S. 1,451,151, Apr. 10.

53. Pulverizing mill. GEORGE H. FRASER. U. S. 1,451,152, Apr. 10.

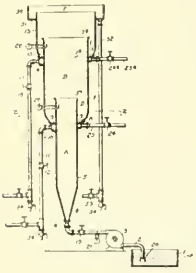
54. Pulverizing mill. GEORGE H. FRASER. U. S. 1,451,153, Apr. 10.

55. Machine for grinding and crushing. GEORGE H. FRASER. U. S. 1,451,154, Apr. 10.

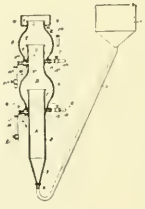
56. Machine for crushing or grinding. GEORGE H. FRASER. U. S. 1,451,155, Apr. 10.

57. Machine for crushing and grinding. GEORGE H. FRASER. U. S. 1,451,156, Apr. 10.

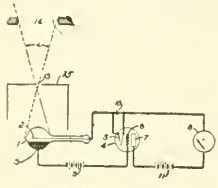
58. Method of separating granular solid materials. MARTIN HOKANSON. U. S. 1,449,603, Mar. 27. The method of separating solid materials of different specific gravities or sizes, which consists in subjecting the material to an upwardly flowing stream of water of such diameter relative to its velocity as to cause the heavier particles to move radially to the outside of the stream and the lighter particles to remain inwardly thereof, continuing such flow until the particles of a given grade have moved to the outside of the stream, and continuously withdrawing such material and water uniformly around the stream.



59. Apparatus for separating solid materials of different specific gravities. MARTIN HOKANSON. U. S. 1,449,604, Mar. 27. Apparatus for separating solid granular materials, comprising a vertical vessel, means for forcing the materials in a finely divided form mixed with water upwardly through said vessel, said vessel intermediate its height being provided with a portion of increasing diameter providing an annular chamber in which the solids are deposited by radial separation from the vertical stream, said annular enlargement being provided with a series of outlets uniformly spaced around said vessel, an annular chamber receiving from said discharge openings, said annular chamber being of progressively increasing dimensions from one side, and a controllable outlet from the largest point of said drawn-off chamber.

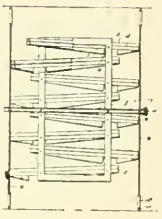


60. High-temperature measurement. HERBERT E. IVES. U. S. 1,449,512. A device for measuring the temperature of a highly heated body comprising a photo-electric cell for translating radiant energy into electrical energy, a perforated diaphragm at a fixed distance between said cell and the highly heated body, the perforation in said diaphragm subtending a solid angle from all parts of the cell smaller than that subtended by the highly heated body, a vacuum tube for amplifying the current of said electrical energy, and means for registering the amplified current.

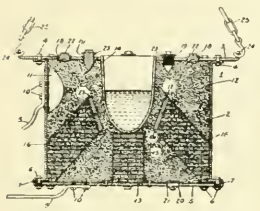


61. High-frequency screen. HARRY H. KELLER. U. S. 1,446,298, Feb. 20. A multiple deck screen, a tensioned supporting means arranged for unitary action and

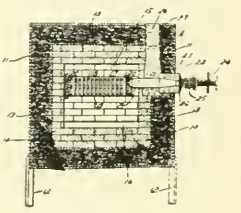
a disturbing force for said means to cause the screen to move as a unit with a true rectilinear motion.



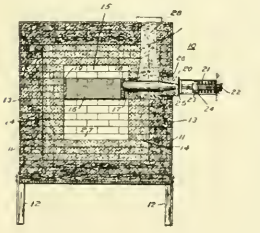
62. Electric resistance furnace. GEORGE M. LITTLE. U. S. 1,456,890, May 29. An elec. fur. comprising a metal container, a metal cover for said container, a metal base plate secured to and insulated from said container, means for attaching elec. supply circuit terminals to said container, granular resistor material surrounding said crucible and means in said cover for compressing said resistor material in said container.



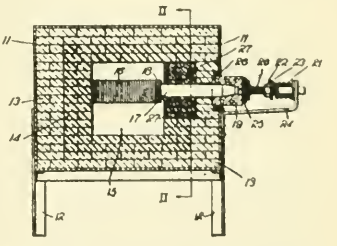
63. Electric furnace resistor. GEORGE M. LITTLE. U. S. 1,456,891, May 29. An elec.-resistance fur. comprising a built-up resistor consisting of single flat carbonaceous plates of relatively large area of cross-section alternating consecutively with a plurality of flat carbonaceous plates of relatively small area of cross section, the area of cross-section of the small plates being in accordance with the kw. input of the fur.

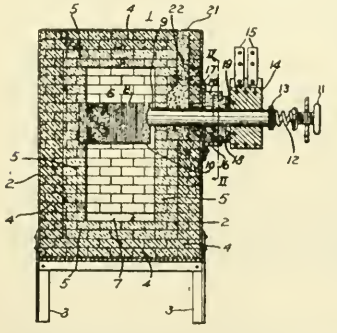


64. Protected electrode for electric furnaces. GEORGE M. LITTLE. U. S. 1,456,892, May 29. An electric furnace comprising a plurality of furnace walls, an electrode extending horizontally through one of said walls and movable relatively thereto during operation of the furnace, a well in said wall, a quickly renewable granular oxidizable barrier in said wall surrounding said electrode over a portion of its length intermediate its ends, said barrier being adapted to prevent chemical action of entering air upon said electrode but permitting free movement of said electrode relatively to said wall.



65. Electric-furnace wall construction. GEORGE M. LITTLE. U. S. 1,456,893, May 29. An electric furnace comprising a plurality of walls enclosing a furnace chamber, a resistor located in said chamber and supported at one end thereof by one of said walls, a plurality of electrodes operatively engaging said resistor to conduct current to and from said resistor, and means for reducing the current leakage between and from said electrodes said means comprising a plurality of spaced-apart refractory members surrounding said electrodes intermediate their ends and having only a relatively small area of surface contact between adjacent plates.

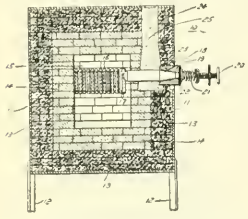




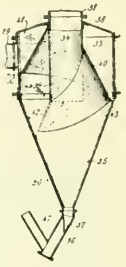
66. Telescoping electrode protector. GEORGE M. LITTLE. U. S. 1,456,894, May 29. An electric furnace comprising a plurality of furnace walls enclosing a furnace chamber, a resistor in said chamber, a carbonaceous electrode extending through one of said walls

for conducting current to and from said resistor and having limited longitudinal movement relatively to said wall, a water-cooled terminal mounted on said electrode at its outer end, granular oxidizable material surrounding said electrode between said wall and said terminal and a two part telescoping container for said granular material, one part being secured to said wall and the other part being located against said terminal.

67. Electric-furnace resistor. Ora A. Colby. U. S. 1,448,388, Mar. 13. In an elec. fur., the combination with a plurality of walls surrounding a fur. chamber, of a resistor in said chamber comprising a plurality of dished refractory elec.-conducting members, granular resistor material in each of said dished refractory members and resilient means for maintaining said dished members in interlocked position in said furnace chamber free of said walls.

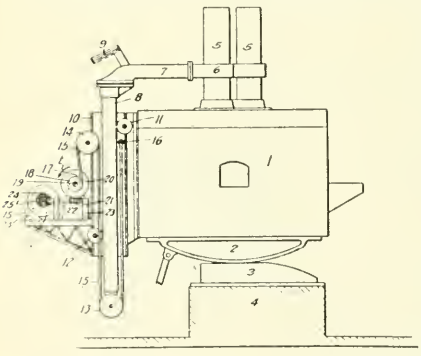


68. Separator. Harry Raymond Collins. U. S. 1,444,585, Feb. 6. A separator comprising a cylindrical casing provided near its upper end with a port through which a current of air laden with material may enter the separator and at its lower end with a discharge chute, a cylindrical relief pipe within the casing, and a downwardly flaring spiral member attached to the relief pipe along a line of progressively varying pitch to provide a spiral chamber of gradually increasing volume above the member.

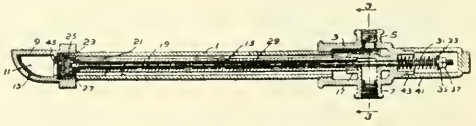


69. Method of making anhydrous magnesium chloride. Paul Cottringer and William R. Collings. U. S. 1,450,912, Apr. 10. The method of making anhydrous magnesium chloride which consists in causing a reaction between magnesium oxide and hydrochloric acid gas, substantially as described.

70. Apparatus for moving furnace electrodes. Waldemar Dyrssen. U. S. 1,450,668, Apr. 3. An elec. fur. having a movable electrode, a motor rotating continuously in one direction at a substantially constant speed, a shaft connected by differential gearing to said motor for moving said electrode, and means operatively connected with said differential gearing for controlling the rate of rotation of said shaft.

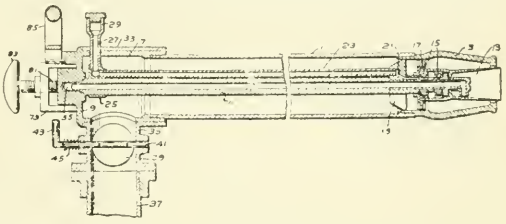


71. Liquid-fuel burner. Milton A. Fesler. U. S. 1,445,826, Feb. 20. A liquid fuel burner, comprising, in combination, a steam conducting tube, an oil conducting tube mounted in said steam conducting tube, a delivery head communicating with said tubes, a single valve for automatically controlling the discharge of steam and oil from said tubes into said head, a stem for said valve projecting through the oil conducting tube, and a coil spring coöperating with said stem to close said valve, but yieldable in response to steam pressure on the valve to allow the latter to open.

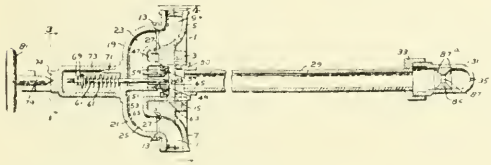


72. Burner. Milton A. Fesler. U. S. 1,445,827, Feb. 20. The combination

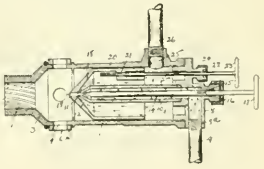
with a support, of a burner movably mounted thereon and having fuel and fluid conducting passages leading to the delivery end of said burner, and a device adapted to lock the burner in the support and to admit fuel to the burner when in one position and adapted to unlock the burner from the support, to cut off the fuel supply and to admit fluid to the fuel passage to drive residual fuel therefrom when in a different position.

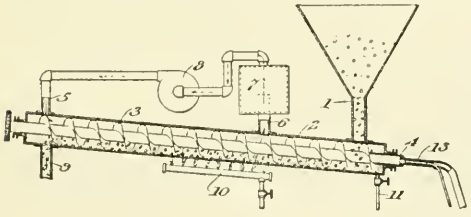


73. Burner. MILTON A. FESLER. U. S. 1,445,828, Feb. 20. In a fuel oil burner, the combination of a casing provided with a delivery office, a mixing chamber located remotely from said orifice, a long conduit extending from said chamber to said orifice, and oil and steam passages leading to said mixing chamber; a valve seat adjacent the delivery ends of the oil and steam passages, and a spring-pressed valve for closing both said passages.

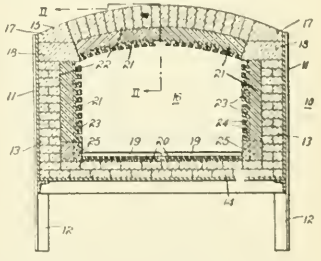


74. Fluid-fuel burner. PAUL B. NORRIS. U. S. 1,446,514, Feb. 27. In a fluid fuel burner, the combination of a body; an atomizing nozzle slidingly mounted in the body and having a nozzle opening with a tapered interior wall extending therefrom; a screw operating in the atomizing nozzle; a stem on the screw locked against axial movement relatively to the body, the screw being adapted to adjust the atomizing nozzle axially of the body; and a contracted fuel nozzle discharging into the atomizing nozzle, said fuel nozzle being placed to the rear of and in alignment with the atomizing nozzle.



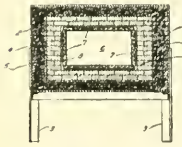


75. Process of and apparatus for heating materials. CHARLES J. REED. U. S. 1,447,888, Mar. 16. In an app. for the heat-treatment of solid material an inclined tubular chamber, one portion of which is maintained at a higher temperature than other portions, in combination with means for causing the solid material to move through the chamber in a specific direction from a lower to a higher level into and out of the heated portion, and means for simultaneously causing mobile material to move through the chamber in the opposite direction.



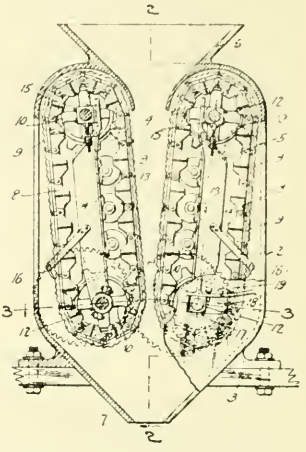
76. Electric furnace. THOMAS A. REID. U. S. 1,444,939, Feb. 13. An elec. heating element for a fur. chamber defined by refractory walls comprising a plurality of spaced-apart relatively narrow, elongated refractory members extending beyond the inner surface of said walls into said chamber each having a plurality of spaced apart transversely extending slots of substantially L-shape adjacent to

the inner surface thereof, and a plurality of end-connected convolutions of relatively heavy and selfsupporting-resistor material located in said slots and extending openly between said refractory members.

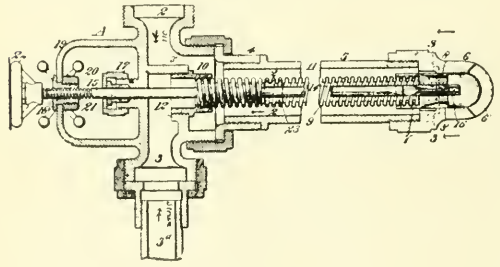


77. Resistor-supporting means. THOMAS A. REID. U. S. 1,444,940, Feb. 13. An elec. resistor supporting means comprising a refractory member having a plurality of rows of relatively small recesses in one surface thereof, the recesses being operatively aligned in two directions.

78. Crushing and grinding machine. JAMES A. WARREN. U. S. 1,448,013, Mar. 16. A crushing and grinding machine comprising a pair of downwardly converging endless belts one of which is mounted to swing outwardly with relation to the other, and means to yieldingly hold the movable belt in its normal position.



79. Burner. CARLYLE J. SHERWOOD. U. S. 1,455,175, May 15. In a device of the character described, a casing, a corrugated tube within said casing, means for securing one end of the tube, means for delivering a liquid under pressure to the interior of the tube, and means for delivering a separate liquid under pressure to the casing, and a valve member secured to the end of the tube operable for simultaneously decreasing or increasing the flow of a liquid from the tube and casing.



Kilns, Furnaces, Fuels and Combustion

80. Ceramic furnaces. Forced draught versus natural draught. ANON. *Brit. Clayworker*, **32**, 71(1923).—Forced vs. natural draught in ceramic fur. was the subject of discussion (May 14) at the Technical congress of the ceramic industry held in Paris. M. Denisse discussed the advantages and disadvantages of the various furnaces and compared the tunnel and continuous ovens, and showed that the use of the fan increased production by 25%. He concluded that a fan, whether employed for drying or for firing, was a valuable aid to the ceramic industry. M. Norray defended the natural draught, in particular he claimed that the use of forced draught was useless in connection with Hoffman ovens, and that it would be wrong to use it in every case. M. Granger, chief of the Testing Laboratory of the Sévres porcelain factory, described improvements in the manuf. of plates, and gave an account of modern plant processes.

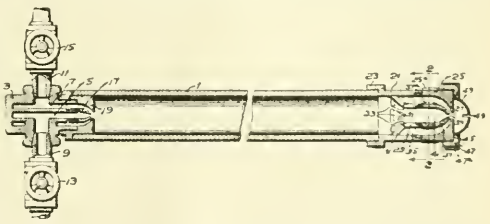
O. P. R. O.

81. Surface combustion with special reference to recent developments in radiophragm heating. W. A. BONE. *Gas J.*, **162**, 423–8(1923); *Gas World*, **78**, 405–9; cf. *C. A.*, **8**, 3358; **16**, 2021.—It has been proved previously that: According to their chem. nature and physical texture all hot surfaces, at temps. below ignition point, have the power of accelerating gaseous combustion in different degrees; at high temps. this difference in power of acceleration practically disappears; during combustion the chem.

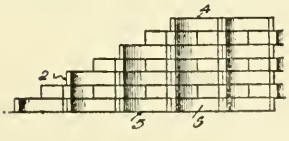
action occurs mainly in, and is usually confined to, the boundary layers between the gaseous and solid phases; the accelerating influence rapidly increases with rise in temp.; and all surface combustion depends upon the absorption of the combustible gas, and probably the O by the surface, thereby becoming activated through assoc. with the surface. These discoveries were applied to industrial purposes and in particular to an installation of 2 boilers at the Skinningrove Iron Works fired on this principle with coke-oven gas (cf. *C. A.* **8**, 1863). A radiophragm was devised which consisted of a porous diaphragm of refractory material through which was forced a homogeneous mixt. of gas and air in the right proportions for complete combustion. This mixt. was burned at the front face of the diaphragm without flame, and maintained the surface there in a state of incandescence. Unfortunately, the radiophragm proved difficult to manuf. and possessed the disadvantage of pre-ignition when working at a temp. above 900°. Recent improvements have been made which have entirely eliminated this risk of backfiring even at much higher temps. The new radiophragms are being made in both flat and circular forms and are finding a wide variety of industrial applications, such as baking, cooking, metal-melting, water-heating, etc. The great advantage lies in the possibility of consuming large vols. of gas within a very limited space with the attainment of very high temps. and without the use of regenerators of a waste of gas. J. L. W. (*C. A.*)

PATENTS

82. Burner. FRANCIS H. BROWN. U. S. 1,451,812, Apr. 17. A burner comprising in combination, a body having a delivery tip provided with an orifice, means for conducting the oil and atomizing fluid to the body and for atomizing the oil as it is delivered to the body, and a secondary atomizing means located within the body between the first atomizing means and said tip and comprising a pair of adjustable nozzles one within the other.



83. Brick or tile for furnace construction. CHARLES F. BINNS. U. S. 1,456,498, May 29. An article of manufacture comprising a brick for wall construction, said brick having flat top and bottom faces coextensive with the length and breadth of the brick and parallel aligned end faces, and a laterally offset portion intermediate of the end faces.



Geology

84. Titanium. Canada. A. H. A. ROBINSON. Can. Dept. of Mines, *Rept.*, (1922).—A very useful and complete report of 119 pages on "Titanium" discusses the manuf. properties and uses of this pigment, as well as those of other useful titanium compounds and describes in detail the occurrence in Canada of large unexploited deposits of titanium ores that may in future become of great industrial importance. O. P. R. O.

85. Magnesite deposits of Grenville, Quebec. G. W. BAIN. *Trans. Am. Inst. Mining Met. Eng.*, No. **1244M**, 19 pp.(1923).—Magnesite and dolomite, both mineral and rock, occur in the Grenville limestone associated with gneisses and dikes. The deposits are found only beneath impervious dikes and on or near the crests of anticlines. They were probably formed by replacement, by means of hot Mg-bearing waters from a granite magma. E. F. H. (*C. A.*)

86. Report on Texas alkali lakes. C. C. MEIGS, H. P. BASSETT AND G. B. SLAUGH-

TER. Univ. of Texas, *Bull.*, No. **2234,** 59 pp.(1922).—Other K deposits of the country are critically reviewed. The brines described are in Lynn, Terry, Hockley, Lamb, Bailey and Cochram Cos. The "lakes" are depressions formed by the removal, by soln., of salt beds from underlying Permian beds. They are filled with silt containing brine and salt crystals, fed by springs coming from the Permian strata. Salt, K, and Mg are the valuable constituents of the brines. A large number of analyses and logs of wells are given. Much of the paper consists of recommendations for the process to be used, and cost ests. E. F. H. (*C. A.*)

Chemistry and Physics

87. Vapor pressure of arsenic. Determination of the vapor pressure of metallic arsenic. SHINKICHI HOSIBA. *Konin Klijke Akad. Van Wetenschappen Amsterdam Proceedings,* **25,** 387–94(1923).—The vapor pressure of gray arsenic in the solid and liquid phases was detd. and the data given in tabular form. The m. p. of gray arsenic is given as 817–18° at a pressure of 35.8 atm. W. M. C.

88. French potash industry. M. MENNECKE. *Chem. Age.,* **8,** 672.—The Alsatian potash deposit consists exclusively of silvinite, (KCl and NaCl), or mineral salt. The method of extraction is by drilling and the use of explosives. The raw salts are delivered for agricultural purposes or are refined in the chem. works to 80 or 98% muriate of potash and used for the manuf. of sulphate of potash. O. P. R. O.

89. Plasticity of ceramic materials. BIGOT. *Brit. Clayworker,* **32,** 71(1923).—The plasticity of ceramic materials was considered by Dr. Bigot at the Technical congress of the ceramic industry, Paris, May 15; he said that colloidal plasticity was of vital importance in ceramics, he described methods of measuring it, the variations it underwent during pressure and firing, and pointed out that processes of rapid manufacture should be preceded by lab. studies on plasticity. O. P. R. O.

90. Ceramic products: degree of firing ascertained by microscope. L. BERTRAND. *Brit. Clayworker,* **32,** 71(1923).—The compn. and structure of various claps and the change they undergo on heating, was discussed by L. Bertrand, of the École Normale Supérieure, at the Technical congress of the ceramic industry, Paris, May 15. Methods of microscopical examn. were described, and it was shown how these could be used to give results with a precision unobtainable by chem. analysis; for instance, a microscope made it possible to ascertain the degree of firing of certain delicate ceramic products. O. P. R. O.

91. Tantalum and its technical uses. S. L. MALOWAN. *Edel Erden u. Erze,* **4,** 26–8(1923).—After a brief history of the discovery and first isolation of the metal, the method of reduction and uses are given. The high m. p. of Ta makes it adaptable for light bulbs in place of W; the life of these lamps is about 1,000 hrs. The metal is also used for instruments in the medical and dental professions because of its hardness and resistance to common acids. W. A. M. (*C. A.*)

92. Calcium aluminium silicate and zeolite question. ST. REINER. *Zement,* **12,** 49–51, 55–7, 65–6(1923).—A review and criticism of previous work on zeolites. R. F. S. (*C. A.*)

93. The constitution of the silicates. G. TAMMANN. *Z. anorg. allgem. Chem.,* **125,** 301–6(1922).—T. finds that the mol. sp. heats of the silicates are additive, and concludes that the mols. are independent and at temps. far removed from their m. p. do not vibrate appreciably. This conclusion is supported by the fact that only in the neighborhood of the m. p. do isomorphous complex substances diffuse into one another visibly. In soln., silicates undergo hydrolysis, and this therefore gives no definite information as to the mols. which exist in the solid. The structure of molten silicates cannot be investigated. The complex silicates differ from the C compds. in that they are decomposed in soln. and in the fused state, and the mol. theory of org. chemistry finds no application in the chemistry of silicates. J. C. S.

94. A practical procedure for the analysis of bauxite. G. CASTELLI. *Rass. min. met. chim.*, **58**, 62–5(1923).—The standard procedure of English metallurgical labs. for detg. H_2O, ignition loss, SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, K_2O, Na_2O, P and S is given with typical *analyses of bauxite* from several countries. C. C. D. (*C. A.*)

95. High-temperature investigation. E. F. NORTHRUP. *J. Franklin Inst.*, **195**, 665–86(1923).—A comprehensive account is given of the methods and technic used in the study of matter at high temp. free from chem. contamination, with special reference to the *high-frequency induction furnace*. J. S. H. (*C. A.*)

96. Rapid technical estimation of iron oxide and alumina in clays and in their products. FERNANDO LUCCHESI. *Giorn. chim. ind. applicata*, **5**, 12–4(1922).—Carefully wash the fresh ppt. of the hydroxides of Fe and Al obtained in the usual way until no more chlorides are found in the filtrate. Place filter and contents in a beaker and add from a buret a known excess of 0.5 *N* H_2SO_4 (50 cc. of the acid for each g. material taken for analysis). Boil for about 10 min. Cool, add 2 drops of 0.02% Me orange, and titrate with 0.5 *N* NaOH until the red hue disappears. (Use for comparison an equal vol. of acidulated H_2O colored with 2 drops of Me orange.) Do not continue toward the yellow, but stop at the point of change. Calc. by difference the acid combined with the 2 oxides. Add to the soln. 1 cc. concd. H_2SO_4, reduce with H_2S and in the same beaker est. the Fe with 0.1 *N* $KMnO_4$. The filter paper present does not appreciably affect the results, which are satisfactory, with the advantage of very rapid execution. R. S. P. (*C. A.*)

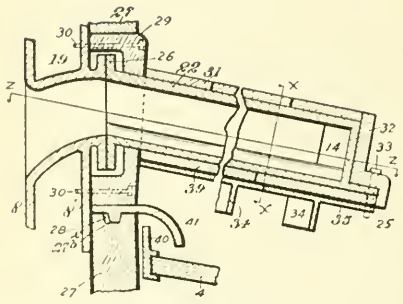
97. Laws of crushing. J. HERMAN. *Eng. Mining J. Press*, **115**, 498–9(1923).—Tests on a wide variety of materials, with a screen discharge ball mill, are presented as curves; energy input *vs.* mesh of product with *Kick's* and *Rittinger's* laws are also shown graphically for comparison. The results are more in accord with Rittinger's law, particularly when the grinding is efficiently done. This law represents the min. power required, Kick's the max. Results on tough materials approach the latter law especially when the reduction ratio is small. The error in applying Kick's law to crushing lies in assuming immediate release of pressure after initial fracture and in failing to consider the energy remaining after this initial fracture which does further crushing work. Rittinger's law also applies to sawing, planing, filing, boring, chiseling, scouring, peeling and gouging. C. C. H. (*C. A.*)

General

98. Oil fuel for clay drying. ANON. *Chem. Age*, (China Clay Trade Rev. Sec.), **8**, 10(1923).—An interesting, illustrated article dealing with a new method of drying clay, giving an account of the expts. carried out for over 6 months with Shell-Mex oil fuel at Great Hallaze China Clay Co. dry at Par, Cornwall. The drying capacity with oil fuel is 156% over that of coal, and the drying cost 93 d. per T. of clay dried compared with 102.58 d. in the case of coal. The clay can be placed on the pan in a very much thinner condition and can be dried very much more quickly without in any way affecting the quality. Transportation costs are slight compared with those of coal, it being possible to pump supplies from the oil reservoir to wherever it is required at a very slight cost. Labor costs are lower, and the cost of the upkeep of the furnace is practically nil with the use of oil. The app. necessary can be easily adapted to the existing coal furnaces. O. P. R. O.

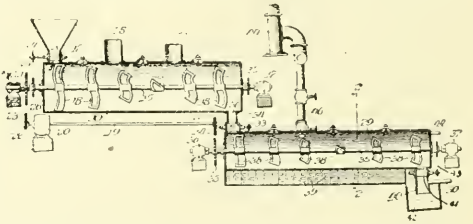
99. Synthetic precious stones. R. QUENSEL. *Geol. För. Förh.*, **44**, 667–9(1922).—*Synthetic rubies* and *synthetic sapphires* have been successfully made from powd. Al_2O_3 in the O-H flame. Coloring agents are discussed. W. S. (*C. A.*)

100. Ore-roasting furnace. ROBERT D. PIKE. U. S. 1,444,209. An app. for the described purpose, the same comprising an outer stationary shell, a vertical rotary

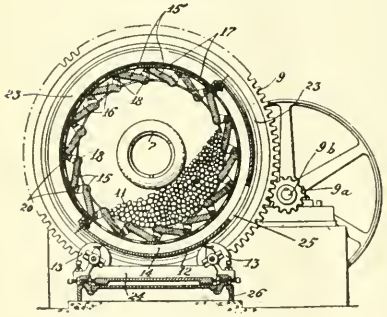


shaft centrally disposed within said shell, a plurality of spaced horizontally disposed hearths arranged within the shell, each hearth provided with outlets for the escape of material therefrom, a series of hollow rabble arms secured and carried by the rotary shaft, means for causing a circulation of a cooling medium through said rabble arms, and a covering of refractory and insulating material for each of said rabble arms.

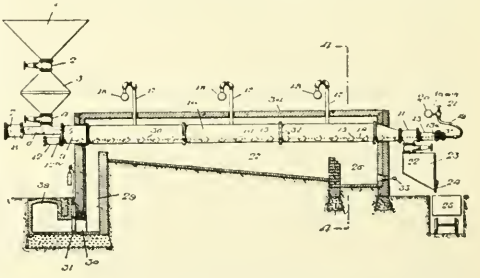
101. Process of treating shale. Stephan Marko. U. S. 1,451,367, Apr. 10. A process of producing combustible gas from oil-bearing shale, consisting in agitating ground shale in the presence of dry heated gaseous products of combustion at temperatures in excess of 600 degrees F, passing the heated shale and gases to a secondary zone of treatment and there continuously agitating the shale and subjecting it to increased temperatures and adding sufficient quantities of superheated steam to the secondary stage of treatment to increase to a predetermined amount the hydrogen content of the evolved gases, separately withdrawing the gas and shale residue from the secondary stage of treatment.



102. Pulverizing mill. Ralph E. H. Pomeroy. U. S. 1,451,472, Apr. 10. In a pulverizing apparatus, the combination of a rotatable shell having perforations in its periphery and having therein loose tumbling devices for assisting in grinding the material, means for supplying a current of air inward through said perforations, and adjustable means for shifting said air supply relative to the shell so as to be admitted to different portions of the shell.



103. Oil-shale retort. George Edward Holmes. U. S. 1,451,575, Apr. 10. Apparatus for distilling oil shale, comprising a heating furnace, a closed horizontal retort, extending through such furnace and subjected to graduated external heat; means for admitting shale into the cooler end of said retort; reciprocating means for stirring the shale when said means moves in one direction and to move the shale along the bottom of the retort in the other direction; means for drawing off distilled products progressively along said retort; means to inject low pressure steam through the agitating means along the bottom of the retort while the shale is in process of distillation; and means for discharging the spent shale at the hottest end of the retort, substantially as described.



CERAMIC ABSTRACTS

Compiled by the

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Vol. 2 October, 1923 No. 10

Author Index[1] to Abstracts for October

Author	Number of abstract
Adams, F. W.	28
Anon.	1, 2, 3, 43, 54, 80, 86
Beebe, D. S	31
Berl, E. and Urban, W.	7
Bertrand, L.	42
Bigelow, F. B.	75
Brown, S. N.	6
Butterworth, F. W.	50, 51
Cadwell, S. M.	90
Cambage, R. H.	81
Chatterton, R. M.	77
Clark, W. G.	36
Cochran, A. D.	53
Cole, L. H.	87, 88
Coon, J. M.	64
Currie, J.	25
Davidson, S.	40
Dickenson, A. W., Dimbleby, V., Norton, L. E. and Turner, W. E. S.	30
Discussion	24
Echert, F.	19
Eckert, G. E.	69
English, S. and Turner, W. E. S.	29
Farish, W. A.	62
Gehlhoff, G.	15
Geiger, C. F.	78
Gerlach, E.	22
Glasenapp, M. von	5, 10
Goddard, W. T.	70, 71, 72
Greenwood, W. W.	63
Haegermann, G.	8
Hardoncourt, A., Jr.	49
Henshaw, S. B.	35
Irvine, E.	14
Jolibois, P. and Lefebvre, P.	4
Keele, J.	82
Kelly, C. and Belvoir, T.	47
Keppeler, G.	16
Knight, M. A.	66
Knight, N.	56
Knorrn, R.	17
Kolzner, J.	45
Kreuger, H.	11
Larcheveque, M. M.	41
Lissauer, A. W. and Fleisher, W. L.	73
Lott, C. R.	34
Maurach, H.	18
Mitchell, A. E.	55
Nesbit, C. E. and Bell, M. L.	52
Nicolardot, P.	21
Normile, T.	65
Norris, W. F.	26
Ohman, J. L.	59, 60, 61
Orcel, J.	58
Platzmann, C. R.	9
Purdy, R. C.	85
Rockwood, N. C.	12
Rosenhain, W.	89
Rousso, J.	13
Scheid, J. F.	67
Schild, A.	20
Staff Article	46, 76
Stenhouse, T.	32, 33
Straight, M. T.	48
Strock, E. J.	83
Tefft, C. F.	44
Thompson, E. A. and Sadler, A.	82
Treischel, C. C.	68
Turner, W. E. S.	23, 27
Valentine, I. R.	74
Walther, K.	57
Wilson, A. W. G.	79
Wilson, H.	84
Young, J. M.	37, 38, 39

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

1. Emery industry (Greece). ANON. *Chemistry and Ind.*, **42**, 594(1923).—It is reported that the Greek Govt. will construct works to facilitate mining and transportation of emery ore, which should increase annual production to approx. 20,000 T. O. P. R. O.

2. Production of bauxite in 1922. *Brick and Clay Rec.*, **62**, 978(1923).—Ark. furnished 266,799 T. and Ga., 30,417 T. of the 309,600 T. of bauxite produced in U. S. in 1922. Statistics given for production and consumption in U. S. including imports and exports for 1921 and 1922. J. W. H.

3. Dissociating bauxite, laterite, and argillaceous substances. ANON. *Oil and Colour Trades Jour.*, **63**, 1870(1923).—According to a recent Ger. patent dissocn. is carried out as follows: The raw material is heated to dull redness, the alumina is then dissolved (for the most part) with dilute nitric acid, leaving most of the iron oxides and silica behind. After sepg. the latter, the soln. is treated in the usual manner. The heating should be carried on in a reducing atm. to reduce the iron to the ferrous state, and thus render it insol. in the dil. acid. The latter may be replaced by nitrous fumes and water. O. P. R. O.

Cement, Lime and Plaster

4. Drying of plaster and its conservation in humid air. PIERRE JOLIBOIS AND PIERRE LEFEBVRE. *Compt. rend.*, **176**, 1476–8(1923).—Plaster dried above 300° loses the property of setting in contact with H_2O, its absorptive power tested by I vapor diminishing with increase of drying temp. Dried at low temp. it darkens rapidly in I vapor; heated to 500° it becomes pale rose; at 800° drying it remains colorless after a month's exposure in a desiccator satd. with I vapor. Sensible heat evolution in transformation by drying was registered photographically with the double galvanometer of LeChatelier and Saladin. A current of air satd. with H_2O vapor at 0° and 15° was passed over a small boat contg. about 0.5 g. plaster and wt. increase detd. Plaster dried between 150° and 300° absorbs H_2O rapidly; when the content of demi-hydrate exceeds 2% the speed diminishes. With very moist air the absorption proceeds much more slowly and is quickly limited to an amt. corresponding to a content less than the demi-hydrate. H. E. B. (*C. A.*)

5. The chemism of the hardening of Roman dolomitic cements; crystalline forms of hydrate of magnesia; colloidal form of hydrated lime. M. VON GLASENAPP. *Zement*, **11**, 489–92, 509–10(1922); *Chimie et industrie*, **9**, 968(1923).—Pulverized MgO, obtained by burning magnesite at a moderate temp., sets when mixed with water, the setting being quicker the lower the burning temp. The hydrated product can still be scratched with a finger nail after 48 hrs., but it slowly hardens. Hardening of calcined magnesite, as observed under the microscope, is due to the transformation of coarse MgO crystals into fine crystals of hydrate; but as combination with water is much quicker than crystn. there must be formed as intermediate compd. an amorphous hydrate more sol. in H_2O. In com. mortars the transformation of MgO is confined to the formation of fine crystals of hydrate in and on the fine grains of cement and at the surface of the grains of sand to which the hydrate adheres. But in lab. prepns. hydrated MgO assumes a surprising variety of forms. G. has even observed one having the appearance of a gel consisting of fine droplets of the same size and shape as yeast cells. A. P.-C. (*C. A.*)

6. The setting and hardening of cements. S. N. BROWN. *Chem. Trade J.*, **72**, 127–8(1923).—The formation of a hard mass from powdered solids and H_2O may occur as follows: (1) Crystn. of the substance; (2) desiccation of colloidal, semi-solid mass or

"gel;" (3) a chem. reaction between 2 or more substances in H_2O giving either a cryst. or colloidal product or both. Burned gypsum or plaster of Paris is an example of (1), CaO mortar and clay of (2), and Sorrel cement of (3). K_2SO_4 accelerates setting of gypsum, while borax retards it. K_2SO_4 retards setting of Portland cement and CaO. The speed of setting of Portland and hydraulic cements is increased by presence of larger amt. of Al_2O_3. Because it withdraws Al_2O_3 from soln. gypsum retards setting of cement. Cements made from stationary kilns contain ash from fuel. Salts present in the ash retard setting. Rotary-kiln cements set more quickly because of absence of ash, and 1–2% of gypsum is usually added to retard setting. Nearly 50% by vol. of hardened Portland cement of normal fineness consists of unaltered particles and could easily be replaced by sand. This emphasizes the importance of having cements finely ground. Formation of $CaCO_3$ has very little effect on hardness of cement. H. C. P. (*C. A.*)

7. Hydraulic binding materials. I. Cement. E. Berl and W. Urban. *Z. angew. Chem.*, **36**, 273–6(1923).—The simple systems CaO–SiO_2, CaO–Al_2O_3 and SiO_2–Al_2O_3 were studied, not in a homogeneous, fused state, but in a heterogeneous condition at low temps. The components were prepd. in amorphous form with max. ratio of area to wt., and with max. reactivity; then intimate mixts. of these were allowed to harden and the crushing strength was detd. SiO_2 contg. 49% H_2O was prepd. from Na silicate and HCl; Al_2O_3 contg. 35% H_2O was prepd. by pptn.; CaO was used in the form of powd. hydrated lime. Cubes contg. SiO_2 and CaO in the mol. ratio 1 : 1, 1 : 2 and 1 : 3, and similar mixts. with the addition of sand to make mortars, showed crushing strength a max. for the mono-Ca silicate and a min. for the tri-Ca silicate, both on specimens that had been kept in a moist closet for 28 days and on those that had been kept for 3 days after treatment in an autoclave at 15 atms. for 8 hrs. Specimens with mol. ratios of $CaO : Al_2O_3$ 1 : 1, 2 : 1, and 3 : 1, show max. crushing strength for the tri-Ca aluminate, and min. for the mono-Ca aluminate. For SiO_2–Al_2O_3 in mol. ratio 1 : 1 there was little apparent binding power, except when the specimens were allowed to lie in alk. water, and then it was but small. For the complex mixt. $CaO.SiO_2 + 2.5\ CaO.Al_2O_3$ there were greater crushing strengths than for either pair taken separately, showing that the mixt. "reacts hydraulically" better than do the simple compds. Tables, curves and diagrams substantiate these conclusions. Zeolite (permutite) was then chosen as an amorphous SiO_2–Al_2O_3 complex and its behavior with CaO noted. The permutite, $Na_2O.Al_2O_3.3SiO_2$. (3.5 to 5) H_2O, was dried, powd., mixed with sand, and treated with increasing quantities of CaO. The superior limit of strength was reached with 3 to 4 mols. of CaO to 1 mol. of permutite. A reverse of this process, *i. e.*, replacing Ca by Na in the above products, did not take place. Evidently a secondary reaction had taken place, with the formation of Ca silicates and aluminates. Studies on the action of water (vapor) showed that $Ca(OH)_2$ and $Ca(OH)_2.H_2O$ were unquestionably formed from CaO, and that similar points of inflection of curves were found in unsound cement, and less marked resemblances in good cement. W. C. E. (*C. A.*)

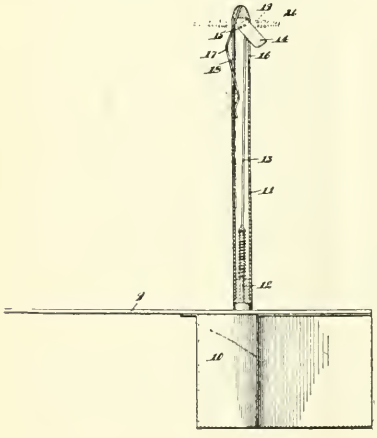
8. Behavior of hardened Portland cement under pure water. G. Haegermann. *Zement*, **11**, 377–9, 388–90, 399–401, 412–3(1922); *Chimie et industrie*, **9**, 311(1923).—If the water is not changed, it first dissolves CaO from the cement, and when it is satd. there is no further change. If the water is changed, or with running water, it continually dissolves out fresh quantities of CaO. An impermeable and insol. coating must be applied to protect the cement, *e. g.*, $CaCO_3$, which explains why cement hardened in air or under natural water (contg. bicarbonates and free CO_2) behaves better under water than one hardened under pure water. A. P.-C. (*C. A.*)

9. Protection of cements against the action of acids. C. R. Platzmann. *Zement*, **11**, 390–1(1922); *Chimie et industrie*, **9**, 312(1923).—P. investigated the use of "Margalite," a $PhOH$-CH_2O condensation product prepd. by Marcusson. One kg. covers

2 m.² of concrete. Test pieces made from 1 part blast furnace slag, 0.25 part of trass, and 0.75 part of normal sand were treated with Margalite 3 weeks after prepn., and 10 days later were immersed in 10% H_2SO_4 and 25% HCl, resp. After 33 and 47 days' immersion the crushing strength was 306–319 kg. per cm.² A. P.-C. (*C. A.*)

10. Crystalloids and colloids in the theory of cement. M. VON GLASENAPP. *Zement*, **11**, 446–8(1922); *Chimie et industrie*, **9**, 312–3(1923).—Crystals of *hydrated Ca silicate* can be observed under the microscope. They are always in the form of needles, grouped in rosettes against a background which seems to be formed of very fine grains constituting a gel the opacity of which under the microscope increases with age. Even after one year this gel still retains its colloidal texture, and it is doubtless this constituent which plays the principal rôle in the hardening of the cement. The crystals of the rosettes can be reproduced and observed by applying a drop of water to cement dust under the microscope. A. P.-C. (*C. A.*)

11. Effect of low temperatures on the hardening of cement. H. KREUGER. *Beton u. Eisen*, **21**, 74–8(1922); *J. Soc. Chem. Ind.*, **41**, 635A.—K.'s investigations cover the effect of low temps. on the compressive strength of 1 : 3 cement and sand mortar contg. from 8% to 15% H_2O. The normal tests were for mixts. with 8% H_2O, and hammered into mold, 7 days, 345, and 28 days, 560 kg. per sq. cm. Immediate exposure for 3 days at —15° to —18°, followed by 1 day moist air at +15° to +18° and the rest in H_2O at same temp., showed reductions in compressive strength in cubes with 8% H_2O of only 23% and 16% for 7- and 28-day tests. Similar frost exposure tests beginning at the start, the middle and the end of the setting period showed the following reduction in compressive strength, resp.: for the 28-day test only 14%, 4% and 0%. Plastic mixts. made by hand contg. 12.7% H_2O showed normal tests, 7 days, 154 and 28 days, 317 kg. per sq. cm. The losses by immediate frost exposure were 30% and 35% resp. The losses by frost exposure at beginning of set as above were, for the 28-day tests, 24.0%, 22.7%, and 17%, resp. Injury was avoided and normal strength developed if the mortars contg. 8% H_2O were kept for 2 days at +4° to +6° before the 3-day exposure to —18°, followed by 1 day in moist air and the rest in water at +15° to +18°. Alternations of —18° and +18° on successive days, following 1 day of moist air at +15° to +18°, reduced the strength after 28 days by only 14%. If, however, the freshly mixed mortar was immediately exposed to —18° for 1 day and then to 1 day in H_2O at +18° and 1 day in air at —18° to the end of test, the loss of strength in the 28-day test was 60%. Plastic mixts. (15% H_2O) were weaker at the start and lost heavily by the alternating treatment. At +3° the rate of hardening is only half of the normal rate at +15° to +18°. The practical point is that 2 days holding of the mortar at +4° to +6° protects it from damage by subsequent freezing. Reference is made to studies on cooling of fresh concrete in freezing weather by T. Yoshida, *C. A.*, **16**, 152. J. O. H. (*C. A.*)



12. A new "wet" process of lime manufacture. N. C. ROCKWOOD. *Rock Products*, **24** [19], 25–8(1921).—An illustrated description of the patented process of Schaffer and Crow (cf. *Ceram. Abs.*, **1** [3], 92 (1923) for utilizing H_2O vapor in calcination. C. C. D. (*C. A.*)

PATENT

13. Counting device. JACQUES ROUSSO. U. S. 1,463,910, Aug. 7. A counting device

comprising a guide; counting means on said guide operable by the passage of articles thereon; a register operable by said counting means; and means, operable by said register, for locking said counting means against operation after a pre-determined number of operations thereof in position to prevent the passage of further articles, substantially as described.

Glass

14. Optical glass. E. Irvine. (*Nat. Phys. Lab.*) *Engineering*, **116**, 93(1923).—In the work on optical glass Miss I. has been able to make large pots by the pressure-casting process. For the viscosity researches, rods of glass had been drawn by means of an appliance due to R. L. Frink and the National Physical Laboratory. Previously the rods had been drawn through water-cooled steel vessels at such a rate that they became chilled in the desired shape; iron has been advantageously replaced by aluminum. Really satisfactory pot materials, which will resist the attack by the molten glass, have not yet been found; pure fused zirconia is still on trial. O. P. R. O.

15. Volume production of incandescent lamp bulbs. Georg Gehlhoff. *Zeits. d. V. deut. Ing.*, **67B** [21], 524–6(1923).—Description of bulb production as practiced in Ger. discussing types of bulbs, compn., melting and working practice. W. M. C.

16. The basis of progress in the glass industry. G. Keppeler. *Zeits. d. V. deut. Ing.*, **67B** [27], 509–12(1923).—Discusses progress achieved in fuel tech., machine development in hollow ware, table ware, window, plate and other glass manuf. Chem. and phys. developments in the field of glass tech. W. M. C.

17. A modern window glass plant. R. Knorrn. *Zeits. d. V. deut. Ing.*, **67B** [27], 513–6(1923).—Gives plans and working drawings describing layout of the plant at St. Ingbert in Pfalz. W. M. C.

18. The technology of the glass furnace. H. Maurach. *Zeits. d. V. deut. Ing.*, **67B** [21], 517–22(1923).—Treats of fur. design and opern., combustion conditions, temp. measurement, burner arrangements, fuel requirements and plant design. W. M. C.

19. The annealing of glass. F. Echert. *Zeits. d. V. deut. Ing.*, **67B** [21], 522–3 (1923).—The conditions underlying the presence and elimination of strain are described. W. M. C.

20. Grinding and polishing of plate glass. A. Schild. *Zeits. d. V. deut. Ing.*, **67B** [21], 538–42(1923).—Detailed paper with micro-photographs of ground and polished glass surfaces, diagrams, and sketches of equipment. W. M. C.

21. A comparison of French, English, German and Austrian laboratory glassware. P. Nicolardot. *Chimie et industrie*, **9**, 233–44, 469–84(1923).—N. reviews previous work, describes at considerable length his own expts., comparing them with previous results by others, and reviews and discusses the work of Canwood, English and Turner (*C. A.*, **12**, 212). The most suitable test for rapid classification of glass, from the standpoint of resistance, is heating with water under pressure at 120°, 140°, 160° and even higher, for a sufficient time to obtain appreciable attack of the glass. 0.1 *N* HCl attacks glass less than pure H_2O does at 100°, but more after than before heating with H_2O under pressure. Attack by NH_4Cl is due to the NH_3, not the HCl. High-grade glass wares are resistant, even after prolonged use, English and French glasses being superior to German. Steam does not attack glass as much as water does (at the same temp.) and can be neglected when boiling analytical solns. at atm. pressure. N. gives analyses of the 14 glasses which he investigated, and discusses at great length the effects of the various constituents. This part cannot be satisfactorily abstracted.

A. P.-C. (*C. A.*)

22. Catalysis in glass formation. E. Gerlach. *Chem.-Ztg.*, **47**, 146(1923).—F and missible amts. of Fe_2O_3 in limestone for sands of various iron contents. From

calcns. of representative batches, the max. permissible for a decolorized glass was found to be 0.18%, but this is regarded as a dangerously high figure in practice. Samples quoted ranged from a Dowlow (Buxton) limestone with Fe_2O_3 0.01% (non-volatile insol. matter 0.32%) to a soapworks waste with Fe_2O_3 0.10% (non-volatile matter 0.51%). For pale green glass suitable samples ranged from Barnetby limestone with Fe_2O_3 0.14% (non-volatile matter 1.94%) to a chem. works waste with Fe_2O_3 0.32% (non-volatile matter 3.62%) while for a dark green bottle glass the lines with high Fe_2O_3 content were desirable as, in conjunction with a low-grade sand, they supplied the bulk of the coloring oxide needed in the glass. J. S. C. I.

23. British glass industry; its development and outlook. W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 108–46(1922).—Presidential address, contg. an account of the history of the industry with statistics as to number of factories, workmen, production, exports, imports, etc. (*C. A.*)

24. Problems in the melting of glass. II. Discussion. *J. Soc. Glass Tech.*, **6**, 147–56(1922).—(1) *Best ratio of cullet to batch.*—When batch alone is used, the glass takes longer to plain and is also somewhat softer. It may contain very fine seed which affects its working properties. The cullet contains more iron and more alumina than the batch, therefore it makes the glass more colored and more viscous, but it helps in plaining. Practice varies widely, depending largely on the amount of cullet available. In the case of tank furnaces, the important thing is to keep the ratio constant so that the properties of the glass will not change. (2) *Salt cake vs. soda ash in soda-lime glass batches.*—Although no scientific explanation is at present available, it is a matter of experience that glass made from batch containing salt cake is easier to work, and apparently has a longer viscosity range than if soda ash alone is used. It was suggested that this is due to greater homogeneity. It is American practice in making window glass to use 1 part salt-cake to 2 parts soda ash. However, the salt cake is more corrosive of the refractories and sometimes gives a bluish green color. See also *Ceram. Abs.*, **2** [5], 93(1923). (*C. A.*)

25. Columnar structure in sandstone tank blocks after rapid heating and cooling. JOHN CURRIE. *J. Soc. Glass Tech.*, **6**, 156–60(1922).—Blocks forming the lower course of the walls of a green bottle glass tank became rapidly heated from about 800° to 1300° during the draining of the tank and were then rapidly cooled. They were found to show a columnar structure normal to the cooling planes, similar to that of basaltic columns. Four photographs are reproduced. (*C. A.*)

26. Medieval glass of York Minster. W. F. NORRIS. *J. Soc. Glass Tech.*, **6**, 160–7(1922).—York Minster has over 25,000 sq. ft. of English glass of the 13th, 14th and 15th centuries. During the War, 23 windows were removed for preservation, and it was then found that the lead had disintegrated and the glass seemed to be diseased, many pieces being badly pitted and some having scaled off until they were paper thin; others had crumpled to dust. The windows were being gradually cleaned and releaded, the mellowing effect of centuries of dirt being removed but the original brilliancy being restored. W. E. S. Turner explained the disease as due to a *gradual hydration of the glass*, which was doubtless a lime glass made from French sand with perhaps not much alumina. (*C. A.*)

27. Heat-resisting glasses. W. E. S. TURNER. *J. Roy. Soc. Arts*, **71**, 401–12; *Glassworker*, **42** [30], 13, 21, 22, 24, 26(1923).—A discussion of the whole subject. The work done at Jena, establishing the relationships between the mechanical properties and chem. compn. in glasses, needs revision. Also in *Potter Gas.*, **48**, 607–17 (1923). G. E. B. (*C. A.*)

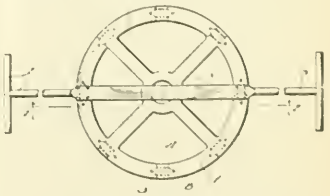
28. Manufacture of colorless glass in a tank furnace. F. W. ADAMS. *J. Soc. Glass Tech.*, **6**, 205–10(1922); *Pottery Gaz.*, **47**, 1031, 1033.—The tank should be long

enough and deep enough to melt and "fine" the charge properly before it is passed through the "doghole." The working end should hold slightly more than the estd. daily output. Good refractories are essential, as modern machines need a fairly soft and therefore corrosive batch. A batch with a high content of soda ash corroded blocks of high silica content more than blocks of high alumina content in the same furnace. A block which withstood the action very well was close grained and had the compn. SiO_2 58.9, Al_2O_3 37.58, Fe_2O_3 1.71, CaO 0.54, MgO 0.47, Na_2O 0.36, K_2O 0.84%. The necessity for regular chem. supervision of batch materials and for thorough mixing and accurate weighing is emphasized. MnO_2 is a cheaper decolorizer than Se, but is affected by furnace conditions, *e. g.*, by standing over the week-end. With Se quick melting is essential to prevent loss by volatilization. The coloring effect is regarded as due to colloidal particles of Se sepg. out. The melting temp. is detd. by the type of batch used and by the output, but is normally about 1350–1400°. More Se is needed at lower temps., with the danger of producing a dirty brown color, which with a rise in temp. of the tank turns to a decided pink. The Se glass in the leer if too cold becomes green, and if too hot pink. Storage of Se glass in strong sunlight has been known to produce a yellow color, which can only be removed by re-melting. A. recommends the stabilization of working conditions as far as possible once they have been worked out for a given amt. of iron in the batch. For discussion see *Pottery Gaz.*, **47**, 1208–10.

J. S. C. I.

29. Density of soda-lime-magnesia glasses and calculation of density. S. English and W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 228–31(1922).—The substitution of magnesia for lime in the trisilicate glasses brought about a continuous lowering of the d. without any sign of a minimum value, such as was observed in the case of the annealing temps. Baillie's proposal (*Ceram. Abs.*, **1** [5], 145; *ibid.*, **1** [1], 19) of the formula, $A/D = p_1/d_1 + p_2/d_2 + p_3/d_3 + \ldots$ instead of Schott's, $100/D = p_1/d_1 + p_2/d_2 + p_3/d_3 + \ldots$, A being the sum of the oxides, gave good results, but the authors' method (*C. A.*, **14**, 3509) had a more definite basis in that the d. of silica was assumed unchanged in the glass and from that the soda, lime, magnesia, etc., factors could be calcd. by using a plain soda silicate and then a soda-lime silicate, etc. Results obtained by Schott's, Baillie's, and the authors' methods were compared with observed values and it was shown that while Schott's method gave greatly divergent values, those obtained by Baillie's method were very near, and those by the authors' method still nearer, the observed values. J. S. C. I.

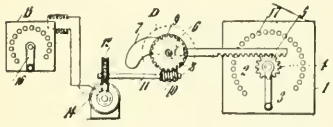
30. Mixing of glass batches in factories. A. W. Dickenson, V. Dimbleby, L. E. Norton and W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 234–46(1922).—The grain size of all constituents should preferably be similar. Very fine sand and in some instances very fine lime should not be included, as they contain undesirable impurities. The danger of segregation of perfectly dry batch when stored in hoppers over the "doghouse" of a tank furnace is pointed out and also the beneficial effect of moisture, up to a point, in preventing this. Various analyses of batches mixed by hand and by 3 different types of mixing machines showed a decided superiority as regards homogeneity of the machine-mixed batch over that mixed by hand. J. S. C. I.



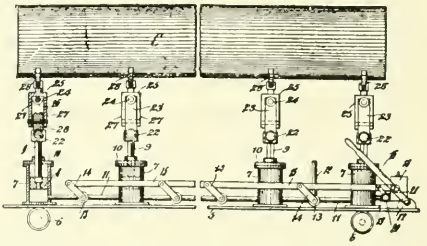
PATENTS

31. Tool for cutting glass while in a plastic state. Daniel S. Beebe. U. S. 1,457,491, June 5. A cutting tool for glass comprising a frame in the form of a ring having radial stiffening arms extending across the same, and a series of small cutting wheels mounted in a circle on the under side of the ring so as to rotate about axes forming radii of said circle.

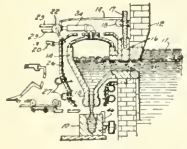
32. Method and apparatus for drawing glass cylinders. THOMAS STENHOUSE. U. S. 1,460,285, June 26. In mechanism to control the speed of acceleration of drawing glass cylinders, a movable part controlling the operation of the drawing apparatus, and mechanism to automatically actuate said movable part, including a rectilinearly movable element, a cam co-acting with said element; and means to operate said cam at a predetermined speed whereby the speed of the drawing operation is automatically increased in proportion to the decrease in temperature of the glass.



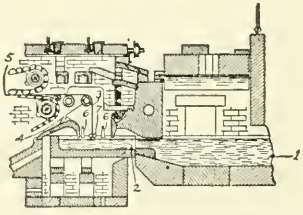
33. Method of and apparatus for supporting glass cylinders. THOMAS STENHOUSE. U. S. 1,460,286, June 26. In a support for glass cylinders, a plurality of spaced supporting units, each including a cylinder and a piston operating therein, a supporting saddle for the glass cylinder, mounted upon each of the pistons, and transversely movable relative to the axis of the cylinder, fluid supply means connecting and affording communication between the several cylinders, the fluid medium in the respective cylinders exerting a variable sustaining influence upon the pistons thereby to equally distribute the weight of the glass cylinder between the supports, and manually operable valves for closing communication between said cylinders to maintain the sustaining influence of the fluid medium constant and lock the supports against vertical movement during the severance of the glass cylinder into sections.



34. Apparatus for producing charges of molten glass. CLYDE R. LOTT. U. S. 1,458,834, June 12. The combination with a receptacle to contain molten glass and having a discharge opening in the bottom thereof through which the glass discharges downwardly, a mechanical cutter, means to periodically operate the cutter to sever charges of glass at a point a short distance below the discharge opening and then withdraw the cutter, a burner located at one side of the path of the glass, and means to shift the burner beneath the discharge opening after the cutter withdraws and direct a flame against the freshly cut surface of the glass. See *Ceram. Abs.*, **1** [1], 23(1922).

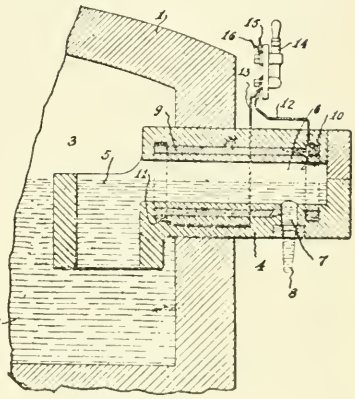


35. Method of and apparatus for drawing sheet glass. SETH B. HENSHAW. U. S. 1,460,582, June 3. In a sheet glass drawing apparatus, means for drawing a flat sheet from the glass mass and rolling dies engaging the edges of the sheet near its source driven to have a peripheral speed of not to exceed one-half the speed at which the sheet is drawn.



36. Feed trough for glass furnaces. WALTER G. CLARK. U. S. 1,458,522, June 12. In combination, a furnace; a feed trough therefore comprising a horizontal portion having a closed outer end wall and downwardly opening port near its outer end and having at the inner end an upflowing glass feed trough consisting of a riser chamber open at both ends and extending somewhat above the axis of the housing through which the glass rises upwardly from below its level within said chamber; an electric-resistance heating means associated with said trough and completely embedded in the walls thereof and extending substantially from end to end

of the horizontal portion whereby to melt the glass within said trough; a second heating means comprising electrodes in communication with the interior of the trough at opposite ends thereof, whereby the glass may be maintained in molten state by passing a heating current through the molten glass; and a pair of controllable electric current supply means whereby current may be supplied at will to said resistance heating means or said second means or both.

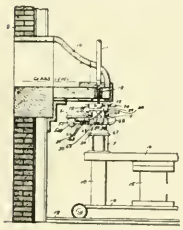


37. Glass-blowing machine. JAMES M. YOUNG. U. S. 1,458,454, June 12.

38. Take-out and delivery device for glass-blowing machines. JAMES M. YOUNG. U. S. 1,458,455, June 12.

39. Take-out and steadying device for glass-blowing machines. JAMES M. YOUNG. U. S. 1,458,456, June 12.

40. Method of and apparatus for feeding molten glass. SCOTT DAVIDSON. U. S. 1,458,167, June 12. The herein described method of delivering glass to the molds of a forming machine, which consists in the establishment of a regulated stream of glass, arresting the downward movement of said stream until a sufficient mass of glass has been accumulated therefrom, supporting said mass along its bottom and its side a predetermined interval, and then first releasing the mass entirely on its bottom and simultaneously during such release imparting to the batch a rotary movement, and immediately subsequent to the release of the batch on its bottom a jolt for assisting the discharge of the batch by gravity.



Heavy Clay Products

41. Study of the warpage of refractory mixtures, clays, kaolin, and porcelain when fired at different temperatures. M. MARC LARCHEVÊQUE. *Céramique*, **26**, 167–80 (1923).—The purpose of this work was to study the resistance of ceram. bodies to warpage at different temps. Bars 25.1 cm. x 2.2 cm. x 1.0 cm. were molded and after they had been dried were placed across two knife edges 20 cm. apart. The warpage of these fire-clay bars after being fired to different temps. was measured. Tests were made on raw bars and also with the same clay bars after they had been fired between 1375° to 1400°C. It was found that the warpage was much less on the bars that had been fired to 1375–1400°C than on the raw bars. The resistance of kaolins to warpage after firing was very high. The resistance of some porcelains to warpage was very good. Tests were also made with mixts. of washed fire clay and grog and different kinds of sand. Bodies made with 1 part of clay and 1 part of sand were more resistant to warpage than bodies containing 1 part of clay and 1 part of grog. Bodies contg. the finer grained sand were more resistant to warpage than those contg. coarse sand. Mixts. contg. a no. of clays instead of one often produced bodies having a higher resistance to warpage than bodies composed of one clay. H. G. S.

42. The use of the petrographic microscope in ceramics to examine the structure of clay in the raw and fired state. LÉON BERTRAND. *Céramique*, **26**, 180–94(1923).—The examn. of thin sections with the petrographic microscope affords a quick and easy method of examg. the structure of clays. Microphotos. are shown of plastic clays

free from quartz; clays with fine-grained quartz; clays contg. iron stains, clays contg. coarse grains of quartz and clays contg. crystalline kaolinite. The examn. of thin sections of quartzite also affords an excellent method for selecting the better grades of quartzite for silica brick. With quartzites from a certain district those having the finest grains were found to be best adapted for producing silica brick. By examg. these under the microscope it is possible to select the better grades of quartzite from the poorer grades. Great emphasis is placed upon the size of grain of the quartz both in clays and in quartzites. H. G. S.

43. Government specifications on all types of brick work. ANON. *Brick and Clay Record*, **62**, 869, 872–3, 892(1923). J. W. H.

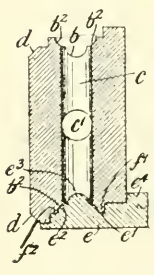
44. Darlington Clay Products Co. II. C. FORREST TEFFT. *Brick and Clay Record*, **62**, 858–62(1923).—For the first installments see *Ceram. Abs.*, **2** [7], 156–7 (1923). Final installment with description of control equip. used for gases passing through drier. Also method of setting kiln, starting fires, burning schedule and kiln cooling. J. W. H.

45. (Coal) Clinker brick. J. KOLZNER. *Rev. Mat. Constr. Trav. Pub.*, **164**, 112–4(1923).—Clinker of approx. compn. in %, SiO_2 40, CaO 12, Al_2O_3 16, Fe_2O_3 12, MgO and alkalies 7, undetd. 3, contg. 10–15% of unburned material has been successfully used for making brick. The dried material is ground in a battery of three mills, the last giving a powder. 8–10% by wt. of lime are then added by either (1) mixing with quicklime and slaking in a tank, (2) mixing with quicklime and slaking in a drum under steam pressure (German Method), or (3) mixing in the open air with lime previously slaked and bolted. K. states that the 3rd. method is less costly as to manuf., maintenance and initial cost, than the other two. The mixt. passes through a muller on its way to the presses. The brick are then piled on trucks and immediately put into an autoclave for 6–7 hrs. under satd. steam pressure of 7–8 kgms. L. N.

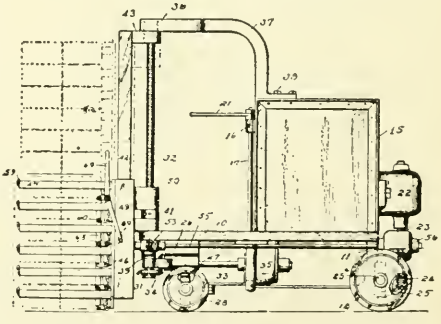
46. Romance in industry. STAFF ARTICLE. *Brick and Clay Record*, **62**, 940–73 (1923).—Technical description of reconstructed plants of Los Angeles Pressed Brick Co. located at Los Angeles, Santa Monica, and Alberhill, mfg. face brick, architectural terra cotta, roofing tile, hollow tile, refractories. The entire object of reconstruction based primarily on reduction of costs and not increased production. Photos of equipment accompany article. J. W. H.

PATENTS

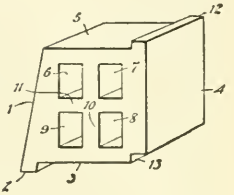
47. Building block. CAROLINE KELLY and THOMAS BELVOIR. U. S. 1,457,437, June 5. A block for building purposes comprising at least three elements stepped relatively to one another both vertically and horizontally, so that each block, although formed in one piece, is in the form of superposed parts and having vertical and horizontal grooves in its edges.



48. Truck for handling hollow blocks and tile. MERTON T. STRAIGHT. U. S. 1,457,639, June 5. A device for handling hollow tile comprising a frame, having a series of horizontal prongs spaced apart so that each may enter the opening of a correspondingly spaced tile of a series of adjacent and symmetrically arranged tile, means for elevating and lowering

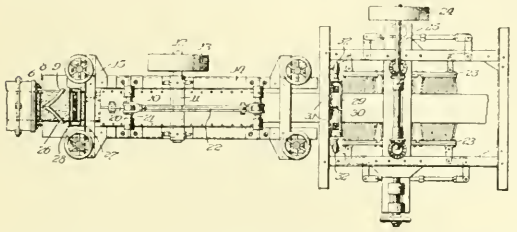


said frame, means for swinging said frame in a horizontal plane when in any of its vertical positions of movement, and means for moving said prongs longitudinally into and out of the tile when said prongs are in any of their positions of movement.

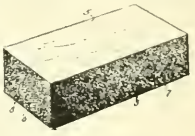


49. Clay shingle block and wall construction. ARTHUR HARDONCOURT, JR. U. S. 1,464,423, Aug. 7. A tile provided with opposite faces each terminating at one edge in a flange projecting beyond the body portion, one of said faces being relatively inclined.

50. Method of forming texture brick. FRANK W. BUTTERWORTH. U. S. 1,463,936, Aug. 7. The method of forming texture bricks comprising applying sand to the surface thereof and thereafter stippling said surface.



51. Sanded texture brick. FRANK W. BUTTERWORTH. U. S. 1,463,937, Aug. 7. A brick or the like having a substantially plane surface, said surface being broken by a series of spaced deformations, and a film of sand upon the undeformed surface of the brick.



Refractories

52. Fire brick disintegration. C. E. NESBIT AND M. L. BELL. *Brick and Clay Record*, **62**, 1042–3(1923).—Fire brick disintegration in linings of blast furnaces making iron seems greatest 40 to 50 ft. from top of fur. The authors, after comprehensive research, attribute disintegration of fire-clay brick in these positions to objectionable iron compounds in the fire clay. If fire-clay brick contains free or loosely combined Fe_2O_3, the CO in furnace atmosphere reacts with Fe_2O_3 depositing voluminous graphitic carbon which bursts the brick. Reaction is fairly rapid at 325 to 525°C. See *Chem. Met. Eng.*, **28**, 987(1923). Brick containing 1½% iron pyrites failed practically in same manner as brick with corresponding amt. of iron ore. The only practical remedy is to weather the clays in a layer not over two feet thick for at least two months. Sufficient space to insure the necessary supply for this period must be provided. If the weather is dry, the layer must be watered weekly. This treatment will oxidize the iron compds. which will be apparent by a change to a brown or yellow color. Such lumps or patches must be discarded and only the unstained clay used. Should the clay slake or break up readily, it should be turned over with a plow or some mech. means to expose the under side and the sorting repeated after weathering. J. W. H.

53. Making stiff mud fire brick. A. B. COCHRAN. *Brick and Clay Record*, **62**, 852–4(1923). J. W. H.

54. A new refractory tester. ANON. *Iron & Coal Trades Rev.*, **107**, 15(1923).—The appliance shown in Fig. 1 has been designed to embody all available experience for ascertaining the actual softening point of refractory materials under load; it also graphically records, by means of an automatic mechanism, the thermal expansion before the softening point is reached and the subsequent contraction, or compression. The app. consists of an elec. carbon resistance fur. 14, and of a lever press. The fur. is designed for a voltage of 100 to 120, and consumes about 12 kw. up to a temp. of 1600°C. The

fur., which is vertical, has an internal diam. of about 100 mm. An anvil of hard electrode carbon, about 300 mm. long, and 60 mm. diam., projects into the bottom of the fur.; the test piece is placed on the anvil and has a diameter of 50 mm. and a height of 50 mm.; it is cut out of a standard sized brick of the material to be tested, by means of a hollow diamond drill. Cubes can also be used, sawn out of finished bricks and having the two ends smooth. When new refractories are subject of research and test, the test pieces are conveniently prepared by pressing the substance into a steel mold and by subsequent firing. The upper carbon anvil or ram of 480 mm. length and also 60 mm. diam. is loaded. This is accomplished by means of the simple lever 1, which has its fulcrum at 2 and at the other end is forked and carries the two hinge pins 3. These pins press on the bearing of the plate 5, which hangs on 1 from which it can readily be detached. The plate 5 rests on the carbon ram 6. The load is varied by simply varying wt. in the scale-pan 12 which is hung from the lever 1 at point 4; the wts. can be varied between 20 and 40 kgs., which on an area of 20 sq. cm. corresponds to a load of 1 to 2 kg. per sq. cm. The plate 5 can be lifted from the ram 6 by means of the releasing gear which is worked by the lever 8. The movement of the lever 1, caused by the expansion and softening of the test piece is barely perceptible to the eye. To make the movement plainly visible it is magnified from 10 to 20 × by means of the rod 9 and the pointer 10 which is 1 m. long. By securing a stylus to the pointer 10, a curve is drawn on a recording drum 11

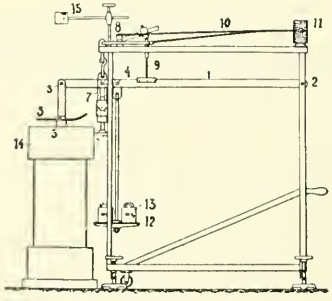


FIG. 1.—Details of refractory testing machine.

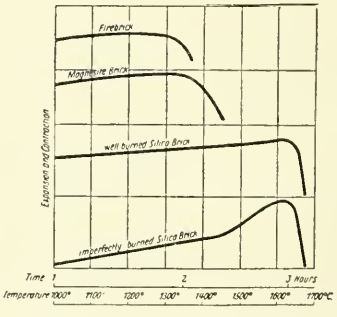


FIG. 2.—Curves showing expansion and contraction of refractories under test.

showing the expansion of the test piece and of the two carbon rods with uniformly increasing temperature. Fig. 2 shows a number of such curves relating to well-known refractories. The horizontal axis is marked with a scale of time corresponding to the speed of rotation of the drum. All curves were obtained with a uniform temp. rise of about 20°C per min. Thus a temp. scale is shown beneath the time scale and corresponding to the latter. The vertical axis measures the expansion and contraction of the test piece in furnace plus the expansion of the portion of the carbon ram which projects into the furnace. The rising portion of the curves corresponds to the period of rising temp. and expansion before softening. The moment the softening point is reached, the curve first becomes horizontal and then deflects rapidly downwards. Different types of refractory materials exhibit characteristic curves; under a load of 1 kg. sq. cm., fire bricks begin to soften between about 1200° and 1300°C. The compression which takes place with a further increase in temp. is slow; the curve for magnesite bricks is similar, with the exception that the softening point is higher, at about 1350–1400°C. The two lower curves represent respectively a high quality well-burned silica brick with a true sp. gr. 2.34 and an imperfectly burned silica brick with a true sp. gr. 2.51.

For the purpose of measuring the temp. of the test piece, the upper carbon ram 6, is provided with an axial hole 20 mm. diam. The center of the upper surface of the test piece can be observed through this hole and the temp. measured by an optical pyrometer protected from the radiant ht. of the fur. by diverting the rays at right-angles by means of the totally reflecting prism 15. Up to about 1400°C, the temp. can be measured accurately through the hole in the upper carbon ram; but above this temp. vapors are formed in the hole which disturb the path of the rays and cause the temp. to appear too low. In order to get over this difficulty a dense refractory tube (pyrometer tube), the lower end of which is sealed, is inserted into the hole in the carbon ram and the inner surface of the bottom of the pyrometer tube is observed. with the pyrometer. The temp. can also be measured by means of a thermocouple and read off on a galvanometer pointer or drawn by means of a recording apparatus. The whole app. is mounted in an angle iron framework. It is fitted with two rollers to enable it to be wheeled into position in front of the elec. fur. and the 4 rising screws in the feet enable it to rest firmly in position. O. P. R. O.

55. Studies on the dolomite system. I. The nature of dolomite. A. E. Mitchell. *J. Chem. Soc.*, **133**, 1055–69(1923).—Dissociation pressures of calcite, magnesite, and dolomite are different and definite; that of calcite being least, of magnesite greatest. It is concluded that the thermal dissociation of dolomite is represented by $CaCO_3, MgCO_3 \rightleftharpoons CaO, MgO + 2CO_2$. The thermal dissociation of calcite follows the Nernst equation. The sp. heats of magnesite and the solid decompn. product of dolomite are, respectively, 0.2033 and 0.2101 cal. at 15–20°. The heats of soln. of dolomite and its solid decompn. product in HCl have been detd., and the heats of formation of the 2 substances from their elements calcd. It is yet impossible to decide whether dolomite is a singular point in a series of solid solns. or a compd. E. F. H. (*C. A.*)

56. A chemical study of dolomites. N. Knight. *Proc. Iowa Acad. Sci.*, **28**, 37–45(1921); cf. *C. A.*, **15**, 3601.—K. reports analyses of specimens of dolomites, so-called, from a number of different countries, and states that some are properly termed dolomites, while others are Mg-limestones, with only a small % of Mg. Some contain very little of either Ca or Mg, but are sandstone. W. G. G. (*C. A.*)

57. The formation of emery observed at an occurrence of corundum rock in Uruguay. K. Walther. *Z. deut. geol. Ges.*, **73**, 292–338(1922); *Mineralog. Abstracts*, **2**, 12.—A corundum rock occurring with cordierite-hornfels and phyllite at Cerro Redondo, near Minas, is petrographically and chemically described. It contains a mineral regarded as monoclinic and dimorphous with diaspore, named *kayserite*. Theories of the origin of emery are reviewed, and a pneumatolysis of sedimentary rocks by AlF_3 is suggested. E. F. H. (*C. A.*)

58. The prochlorites of the corundum-bearing rocks. J. Orcel. *Compt. rend.*, **176**, 1231–4(1923).—The corundum deposits on the eastern coast of the U. S. are always associated with phyllites in which chlorites of rather constant compn. are prominent. Among them corundophilite, $SiO_2/R_2O_3 = 1.5$, and amesite, $SiO_2/R_2O_3 = 1$, contain the highest % of Al. Analyses of specimens from N. C., Pa. and Ga. are quoted. Analysis by O. of a specimen from the Carter Mine, Madison Co., N. C. gave: SiO_2 27.35, TiO_2 trace, Al_2O_3 25.3, Fe_2O_3 0.53, FeO 5.19, MnO trace, MgO 29.91, H_2O —0.08, H_2O +12.09, sum 100.45%. From the optical properties and chem. compn. the prochlorites may be divided into 2 groups: (1) the ferruginous or *ripidolites* defined by the ratio MgO/FeO = 3 or less, and a feeble birefringence (0.001 to 0.005); (2) the magnesian for which the ratio MgO/FeO = about 10 and the birefringence about 0.01. The name *grochauite* is suggested for this group. L. W. R. (*C. A.*)

PATENTS

59. Refractory composition. JOHN L. OHMAN. U. S. 1,458,723, June 12. A refractory composition for heat resisting articles, comprising crystalline alumina and crystalline graphite.

60. Refractory composition. JOHN L. OHMAN. U. S. 1,458,724, June 12. A refractory composition for heat resisting articles, comprising silicon carbide and crystalline alumina, and crystalline graphite.

61. Refractory composition. JOHN L. OHMAN. U. S. 1,458,725, June 12. A refractory composition for heat resisting articles, comprising crystalline alumina and fused silicon oxide, and crystalline graphite.

62. Non-recrystallized refractory material. WILLIAM A. FARISH. U. S. 1,458,913, June 12. A non-crystallized refractory material for heat resisting articles comprising silicon carbide, crystalline graphite, a carbonizing binder, and sand.

63. Magnesia refractory. WALLACE W. GREENWOOD. U. S. 1,461,444, June 12. A composition of matter comprising preshrunk magnesia grains forming the major portion of the total mass and a ceramic bond proportioned and constituted to unite the grains into a super-refractory body which will withstand drying and firing without detrimental shrinkage.

Whiteware

64. Microscopical examination of China clay. J. M. COON. *Pottery Gazette & Glass Trade Rev.*, **48**, 1162(1923).—Used with a grading elutriator it is valuable. General examn. can be made in water, but castor oil is a preferable medium; Canada balsam can be used but does not yield such high relief, as the difference in refractive index is less. It will be necessary to have at hand a quartz wedge and selenite plate, giving red of the first order. Reliable information is contained in A. B. Dick's paper in the "Mineralogical Magazine," 1888 and 1908, the latter giving the corrected optical details, which are readily verified with a decent microscope and proper material.

O. P. R. O.

65. China clay in California. THOS. NORMILE. *Brick and Clay Rec.*, **62**, 979–80 (1923).—Article contains interesting facts regarding early history of whiteware industry.

J. W. H.

66. Acid- and chemical-proof stoneware. M. A. KNIGHT. *Ind. Eng. Chem.*, **15**, 472–3(1923).—A general description of its manufacture and uses. C. H. K. (*C. A.*)

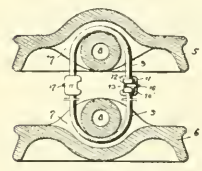
67. The development of high-tension porcelain insulators and the testing of same. J. F. SCHEID. *Elektrotechn. Maschinenbau.*, **41**, 253–61(1923).—A review.

C. G. F. (*C. A.*)

PATENTS

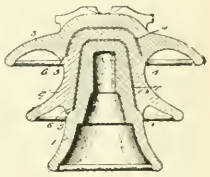
68. Porcelain. CHESTER C. TREISCHEL. U. S. 1,462,396, July 17. A raw batch for a porcelain mix comprising beryl as a component. See *Ceram. Abs.*, **2** [3], 55(1923).

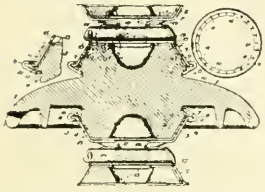
69. Insulator connector. GRANDON E. ECKERT. U. S. 1,458,811, June 12. A cotter pin for use with an apertured supporting member, said pin being formed from a strip of spring sheet metal of materially greater width than thickness, and comprising a pair of legs integral with and connected by spring bends to the head end of the pin, said legs being spaced apart and oppositely offset to form retaining abutments adapted to automatically engage the walls of the apertured supporting member and to prevent accidental disengagement of the pin after its insertion.



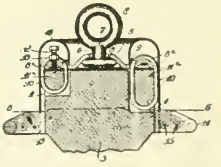
70. Insulator. WALTER T. GODDARD. U. S. 1,458,754, June 12. A pin type

insulator comprising a plurality of nested insulating sections each of which is provided with a hollow central portion having a threadless conical exterior surface, and each of which is also provided with an annular bearing shoulder inclining upwardly toward the center of the insulator, the said inclined shoulder on at least one of said sections projecting outwardly beyond the base of the said conical central portion of the section upon which it is formed and being adapted to coöperate with the said inclined bearing shoulder on the adjacent insulating section, the adjacent conical surfaces of said sections being spaced apart at all points above the surface of contact of said shoulders. See *Ceram. Abs.*, **2** [9], 200(1923).





71. Insulator. WALTER T. GODDARD. U. S. 1,458,755, June 12. The combination with an insulator provided with a central attaching head or lug having an annular undercut shoulder, of a two-part strain member loosely connected to the attaching head, said strain member comprising a cup-shaped body portion having an outwardly directed peripheral flange and an attaching ring, said ring being adapted to embrace the flange of the cup-shaped body portion and being provided with a plurality of independently yielding fingers having supporting engagement with the annular shoulder of the said head.

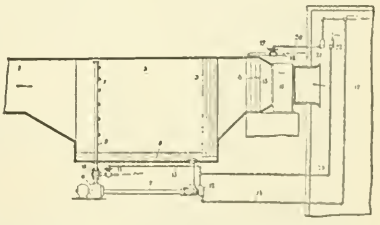


72. Strain insulator. WALTER T. GODDARD. U. S. 1,458,756, June 12. In a strain insulator, the combination with a frangible element of insulating material having apertures therein and a connected element, one of which is supported by the other through the medium of a continuous flexible member laced through the apertures in the frangible element, of a jack screw threaded into the connected element and bearing against the frangible element to exert a separating strain operating to stretch the flexible member and distribute its application of force among its bearing points.

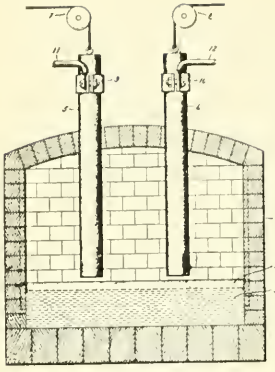
Equipment and Apparatus

PATENTS

73. Humidifying apparatus control. ADOLPH W. LISSAUER and WALTER L. FLEISHER. U. S. 1,458,490, June 12. In combination with an enclosure, a humidifying apparatus control comprising a chamber through which air may be circulated before it enters the enclosure, a humidity control associated with the chamber, a heater for preheating the air coming from the chamber to the enclosure, a thermostat in the enclosure for controlling the heater, a second thermostat in the enclosure connected to the humidity control to prevent the operation of the said humidity control until a predetermined temperature is built up in the enclosure by the heater, substantially as and for the purposes set forth.

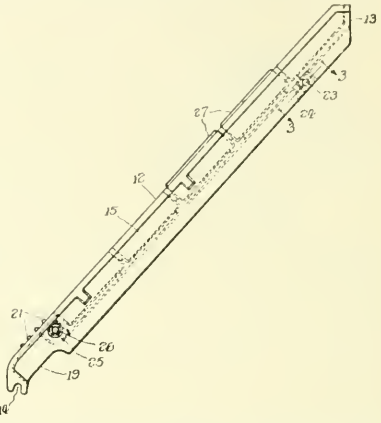


74. Electric furnace. IRVING R. VALENTINE. U. S. 1,457,718, June 5. An electric furnace comprising a receptacle adapted to contain molten charge, a refractory, heat conducting solid body therein located above a charge in said receptacle and in



close thermal relation thereto and means for heating said body by one or more electric arcs.

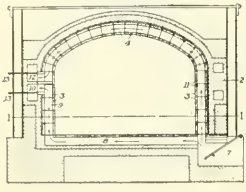
75. Furnace sectional dead grate with brick inserts. FRANK B. BIGELOW. U. S. 1,455,858, May 22. A furnace dead-grate section having a plate with an inwardly extended ledge on its inner face for the greater portion of its length between its upper and lower edges, a plurality of spaced braces joining the top face of said ledge with the inner face of said plate, a brace beneath one of said upper braces connecting the lower face of said ledge with the inner face of said plate beneath said ledge, said plate having an inwardly-offset apertured part adjacent to said lower brace and below said ledge, said plate also having an inwardly-extended plate-section along its top edge below the lowermost brace above the ledge, said plate beneath said top plate-section and adjacent to said lowermost brace having an inwardly-offset apertured part.



Kilns, Furnaces, Fuels and Combustion

76. Making brick and tile in Dixie. STAFF ARTICLE. *Clayworker*, **79**, 549–50 (1923).—The fol. data are given relative to the economy of the Minter system of drying and burning brick and building tile at Dixie Brick Co. of Columbus, Ga. Waste heat from kilns is used in driers, there being a nine track drier 110 ft. in length, accommodating 15 cars, each holding 570 brick. Two fans are used for the necessary draft. These fans are of special design and adapted to the work required. The brick are burned in nine Minter round draft kilns, twenty-seven feet in diameter, each holding 750,000 brick. The hot air from cooling kilns is conveyed in underground tunnels to the drier or to the kilns, as the occasion requires, and the system works so effectively that, though hard to burn, the brick are burned all hard in 72 hrs. Each kiln is burned twice a month, or 18 kilns are burned in 28 d. By this method the kilns are continuous in operation, and there is a decided saving in fuel and also in the time required to burn. J. W. H.

77. Clean producer gas. R. M. CHATTERTON. *Fuels & Furnaces*, **1**, 110–3 (1923).—The advantages of clean producer gas are compared to those of raw producer gas, city gas, natural gas, water gas, fuel oil and electricity. D. F. B. (*C. A.*)



PATENT

78. Muffle furnace. CHARLES F. GEIGER. U. S. 1,464,248, Aug. 7. In a muffle furnace, a muffle having in its roof hollow tiles forming a self-supporting arch and arranged to form a flue for products of combustion, said tiles being of uniform thickness throughout their length and joined together end-to-end without overlapping portions.

Geology

79. Saskatchewan clays and new industries. A. W. G. Wilson. *Nat. Resources of Can.*, **2**, July (1923).—Saskatchewan possesses extensive deposits of important raw materials in her clays; suitable for the manufacture of good building brick, structural and agricultural tile and sewer pipe; her ball clays and stoneware clays for the manufacture of pottery; and her refractory clays for fire brick. The University of Saskatchewan, under the auspices of the Provincial Government, has established a ceramic dept., with W. G. Worcester in charge. W. has supplied bricks for endurance tests in a locomotive on the Can. Pac. R. R., to be examd. at the end of each run. If these bricks stand the test, they will displace millions of dollars worth of imported bricks; but definite prophecies are reserved until final results are known. O. P. R. O.

80. Manganese deposits, South Africa. Anon. *Times Ltd. & Eng. Supp.*, **12**, 426(1923).—Rich deposits of manganese have been found in the district of Johannesburg, these newly-discovered deposits assay approximately 90% manganese. Exploitation on a commercial scale has not been accomplished, but the deposits apparently lie over a fairly extensive area. O. P. R. O.

81. Clays. R. H. Cambage. *Chem. Eng. & Mining Rev.*, **15**, 317(1923).—Clays of great variety are available in large quantity in New South Wales. O. P. R. O.

82. Chemical and physical characters of bentonite. E. A. Thompson and A. Sadler. Can. Rept. Mines, *Summary Rept. 1921*, No. **586**, 73–7(1923).—This clay when freshly exposed varies from light yellow to light olive green, with waxy luster. It is very fine-grained and has a soapy feel when wet. It swells and forms a jelly-like mass in an excess of water. Six samples from Canada and 2 from Wyoming were analyzed and 8 analyses of U. S. samples are quoted (cf. *C. A.*, **16**, 887). The Canadian samples were generally higher in SiO, and lower in Al_2O_3 than U. S. samples. Sp. gr., m. p., power of absorbing water and percentage of water remaining in the clay at temps. ranging from 450° to 700° were detd. There is no fixed relation between swelling properties and the quantity of combined water present. **Report of the ceramic division.** Joseph Keele. *Ibid.*, 253–70; cf. *Ceram. Abs.*, **2** [6], 138(1923).—The work of this division consisted mainly of a study of the raw materials used in the ceramic industries. These include clays, shales, feldspar, quartz, limestone, talc, bauxite, magnesite, etc. The kiln scum which obscures the color of facing brick was studied and methods for its prevention were described. L. W. R. (*C. A.*)

General

83. Quarry blasting. E. J. Strock. *Explosives Eng.*, **1**, 144(1923).—How we drill, blast, and keep records, the Supt. of a large shale and limestone quarry (Colorado Portland Cement Co.) describes in detail a successful system of blasting, giving numerous cuts. O. P. R. O.

84. Our ceramic family. Hewitt Wilson. *Clayworker*, **79**, 552–3(1923).—An interesting dissertation of the characteristics of the components of clay, that is SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O and K_2O. J. W. H.

85. The essentials of meeting competition. Ross C. Purdy. *Clayworker*, **79**, 558–60(1923).—An address before the Neb. Brick and Tile Assocn., Lincoln, Neb. March 7, 1923. J. W. H.

86. (French) Ceramic Congress of 1923. Anon. *Rev. Mat. Constr. Trav. Pub.*, **164**, 99B–100B(1923).—"Le Syndicat des fabricants de produits céramiques de France," with a membership of 512, held its convention at Paris from May 14–18. The first day's session was devoted to the study of forced (mechanical) draft as compared with natural draft in ceramic kilns. Among the other papers read were those on the im-

provements introduced in plate-making by Granger; the sagging of clays, kaolins, ceramic bodies and refractory mixts. at temps. of 1400°C by Larchevêque; the use of petrographic methods in ceramics in the study of the structure of clays and their transformations on heating, by Bertrand; and the colloidal plasticity of clays by Mr. Bigot. On May 16 Yeatman, president of the organization spoke on the work and purpose of the Society, emphasizing the three main events of the year, (1) the creation of a laboratory for the Society, (2) creation of a technical service bureau conducted by an engineer who studies and puts into practice the best methods of firing, and (3) participation in future fairs and expositions, notably that of "l'Exposition des Arts décoratifs de 1925." A business meeting followed. Later a banquet was held, at which Mr. Yeatman mentioned among other topics the apprenticeship for ceramic students now in vogue at "La Manufacture Nationale de Sèvres." May 17 and 18 were spent in visiting ceramic plants. L. N.

87. Silica. L. Heber Cole. (1923.)—Silica in Canada: Its Occurrence; Exploitation; and Uses, issued by the Mines Branch, Dept. of Mines, Canada. O. P. R. O.

88. Diatomaceous earth. L. Heber Cole. (1923.)—Silica in Canada, Its Occurrence, Exploitation and Uses, issued by Canada, Dept. of Mines, Mines Branch. Deposits of diatomaceous earth occur in the beds of numerous lakes and streams in both Nova Scotia and New Brunswick. This material is rarely found compacted and can readily be excavated by manual labor. It occurs in different degrees of purity, and is generally white or cream colored, and sometimes mixed with carbonaceous and arenaceous material in its more impure state. When impure its color may be yellowish or brownish. Nature and mode of occurrence of diatomaceous earths; description of deposits and analysis of these earths are all included in Mr. Cole's report; also uses. O. P. R. O.

89. Hardness and hardening. Walter Rosenhain. *Chem. Met. Eng.*, **28**, 899–901(1923).—A synopsis of a lecture given at various localities during a recent American tour. Parallel phenomena are found in many alloy systems which help to explain why steel is hard. V. O. H. (*C. A.*)

PATENT

90. Acceleration of vulcanization and products obtained thereby. Sidney M. Cadwell. U. S. 1,463,794, Aug. 7. A process for treating rubber or similar material which comprises combining with rubber a vulcanizing agent, a metal M, carbon disulphide and an amine having a replaceable ammoniacal hydrogen, the carbon disulphide and amine being combined with the rubber as separate materials, with respect to one another, and vulcanizing the rubber.

BOOK REVIEWS

The Wares of the Ming Dynasty. By R. L. Hobson. Published by Charles Scribner's Sons, New York City, 1923. Price $25.00.

This is a sequel to "The Early Ceramic Wares of China," by A. L. Hetherington, a work previously reviewed in the pages of *Ceramic Abstracts*[1] (Book Reviews). In his preface the author states, "The purpose of this book is to explain and illustrate as many varieties of Ming as possible. The text is based primarily on information obtained from Chinese sources and the occasional notes made by Europeans who visited China in the Ming period. To this must be added the deductions which can be made from the study of well-authenticated specimens, and, of course, the valuable work enshrined in the books which are mentioned in the bibliography.....The bulk of the

[1] See *Ceramic Abstracts*, **2** [4], 86(1923).

illustrations is drawn from private collections, but reference is made throughout to important examples which can be seen in public museums."

This is an authoritative and scholarly work on what is from a decorative point of view without question the most prolific period in the history of ceramic development.

To one not familiar with the various historical periods and their consequent influence on the work of later ceramists, it is impossible to realize the tremendous influence of the Ming potters. An estimate that does not consciously or unconsciously include the recognition of the inspiration or influence back of any achievement is at best superficial in character.

The Ming potters were by no means pioneers. For centuries previous to the Ming Dynasty, the Chinese had produced glazed colors and textures which would be the despair of studio and commercial art potters if such wares had to be reproduced today.

Fig. 1.—Flower pot with incised designs and colored glazes. Chêng Tê period. H. 6¼ ins. —J. Love Collection.

Fig. 3.—Jar of buff stoneware with pale olive-brown glaze: two dragons in relief disputing a pearl: inbricated pattern incised on ground. About 1600. H. 9 ins.—Franks Collection. (British Museum.)

Fig. 4.—Jar of reddish pottery with green glaze: peony scroll in applied relief, colored yellow and brown. Found in the ruins of Ayuthia. Late Ming. H. 8¾ ins.—British Museum.

Fig. 2.—Vase (mei pi' ng) with designs in cloisonné style and colored glazes. Waves, lotus plants and reeds: band of jewelled pendants. About 1500. H. 14½ ins.—Honble. Evan Charteris Collection.

FIG. 5.—Wide-mouthed jar with gray-green celadon glaze. Eleven panels with animal and plant design in molded relief. Fifteenth century. H. 9¼ ins.—G. Benson Collection.

FIG. 6.—Potiche decorated in cloisonné sty with colored glazes. Green ground. Gard landscape with peacock and peonies. H. 11 ins.—G. Eumorfopoulos Collection.

FIG. 7.—Potiche with decoration in cloisonné style, with colored glazes. Dark blue ground. Taoist subjects—the three Star Gods playing checkers, the Eight Immortals, the twin Genii of Mirth and Harmony and Hsi Wang Mu with attendants. H. 15 ins.—Anthony de Rothschild Collection.

FIG. 8.—Flower pot. Hard buff pottery with colored glazes: deep aubergine brown ground and lotus designs in green, yellow and peacock blue: blue inside. Late Ming. D. 7½ ins. —Franks Collection. (British Museum.)

This does not mean that the present-day ceramist lacks the ability to reproduce these types, but it does mean that he concentrates on the chemical formula and the glaze content without working to a definite texture and color quality. In fact, the technical specialist is rarely able to express himself in terms of texture and color. In this country our own Prof. Binns is possibly a single exception. The museum group are experts in judging textures, and it is to this group, art critics and such works as the one under discussion that the technician must turn for guidance and inspiration.

To return to our subject, the author discusses conditions previous to the Ming period and outlines in fascinating detail the technical methods employed by potters in various periods of the dynasty.

The book is splendidly illustrated, and altogether it is a work that will be a source of inspiration to the technical man and a most valuable addition to the factory library.

The manufacturer who will buy such books as this instead of spending larger sums in purchasing competitors' samples will quickly bring about a great appreciation of quality among his productive and creative force. This greater knowledge would certainly be reflected in future work and would react in favor of a larger business in art wares.

We reproduce some illustrations selected at random from the book.

Another book, "Animals in Chinese Art," is announced. We hope to give some particulars at a later date. This should be a valuable work for the faience and terra cotta men.

F. H. R.

Fig. 9.—Bottle-shaped vase: of light buff stoneware with prunus design in low relief: bamboo-shaped neck. Colored glazes—aubergine on the neck, turquoise on the body and white and aubergine in the reliefs. Sixteenth Century. H. 10½ ins.—G. Eumorfopoulos Collection.

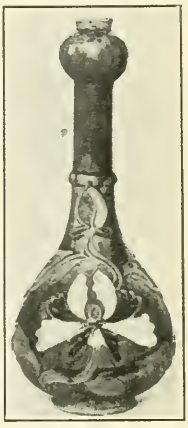


Fig. 10.—Bottle-shaped vase: buff stoneware with colored glazes—green ground and raised lotus designs in turquoise, aubergine, amber-yellow and white. Late Ming. H. 14¼ ins.—H. J. Oppenheim Collection.

Die Keramik im Dienste von Industrie und Volkswirtschaft. (Ceramics in the Service of Industry and National Economy.) By Dr. Felix Singer, assisted by 90 collaborators. Friedr. Vieweg und Sohn, Brunswick, Germany, 1923. 1044 pp., 901 illustrations.

This large volume is the direct result of a suggestion from the industry and is intended to mark the 50th anniversary of the German Clay and Stoneware Works Company of Charlottenburg, certainly a unique and commendable enterprise for such a purpose. The list of collaborators includes some of the best known names of German specialists. The contents of the book deal with the general principles of ceramics, 238 pages, ceramic manufacture, 146 pages, the properties of ceramic products, 62 pages, and the uses of ceramic products, 539 pages. The larger part of the book is hence given to the subject of the products.

The part relating to the principles of ceramics is necessarily restricted to the most outstanding facts but these are presented very well, considering that the sections are

contributed by different authors and a certain lack of unity is unavoidable. Perhaps the treatment of this section has been too sketchy, as for instance in the discussion of drying. The discussion of glazes is still based on Seger's work and might have been revised.

The ceramic manufacturing processes are described very well if the great scope is considered which includes quartz glass, silica brick, magnesite refractories, stoneware, earthenware, porcelain, etc. Steatite products are for some reason emphasized out of proportion.

We find the third section of the book which deals with the properties of the ceramic products to be of special interest since it gives an excellent summary not only of the methods of determining the physical properties of porosity, density, mechanical strength, thermal and electrical properties but also a compilation of physical constants for different types of bodies.

The chapters dealing with the uses of ceramic products emphasize refractories, chemical stoneware and electrical porcelain. A large number of specific uses are illustrated and offer much of interest to the metallurgist and chemist, the sanitary engineer and furnace specialist. The presentation of the subject of chemical stoneware is the best the reviewer has seen. The text is not only descriptive but is interspersed with the results of tests relating to the properties of materials and the efficiency of apparatus. Special uses, such as rolls made from ceramic material for grinding and the shaping of plastic substances, ceramic catalyzers, illuminating accessories, electro-chemical containers and diaphragms, and even ceramic money are discussed.

The book concludes with a very complete treatment of electrical porcelain from all angles. This is about the only chapter in which references to the literature are made with any degree of consistency, for the lack of which the book might be criticized, but that is apparently owing to the dearth of foreign literature available in Germany due to the war. The principles of insulation, the type of insulators, their testing and their failures, and finally the specifications for electrical porcelain are discussed quite fully. This chapter should be of considerable value to the maker and the user of electrical porcelain.

Throughout the book there is evident a consistent endeavor to introduce exact physical constants and definitions in place of the descriptive and inexact terminology now common in the ceramic literature. The printing and the illustrating are well done. It is safe to say that this book is by far the best published on the subject.

A. V. Bleininger

CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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Vol. 2 November, 1923 No. 11

Author Index[1] to Abstracts for November

Author	Number of abstract
Anderson, H. F.	56
Anon.	10, 67, 68, 70, 71, 72, 76, 77, 104, 107, 108, 115, 116, 117, 124, 127
Bailey, C. F.	120
Bawtree, A. E.	2
Bergdahl, B.	106
Berry, H.	20
Bigot, A.	44
Blacker, J. F.	100
Bowles, O.	18
Braun, W.	123
Brissaud, A.	16
British Thomson-Houston Co., Ltd.	66
Brookes, E.	101
Buckley, L. C.	102
Burchartz, H.	12, 74
Cadwell, C. A.	113
Call, B. G.	109
Chapman, W. B.	46
Cordery, F.	22
Corl, R. M.	59
Deguide, C.	130
Delany, J. H.	60
Demongeot, M. A.	57
Denney, G. C.	93
Elliott, C.	4
Ennos, F. R. and Sutcliffe, R.	144
Ferolite, Ltd., and H. B. Clapp	84
Filon, L. N. G., and Harris, F. C.	48
Fukudo, Y.	25
Funk, W.	98
Fuwa, K.	30, 31, 32, 33, 34 35
Gibson, A. H., Lea, F. C., and Griffiths, E.	27
Glasenapp, M. von	19
Goslich	8, 9
Gravely, J. S.	29
Grün, R., and Biehl, K.	142
Hagaman, M.	103
Halle, B.	105
Hardoncourt, A.	75
Heinel, C.	99
Heiser, A.	114
Hitchcock, H. K.	52
Hodkin, F. W., and Turner, W. E. S.	47
Howard, H.	131, 132
Igawa, M.	133
Irons, G. E.	121
Jacobus, D. S.	23
Jones, D., and Emery, W.	79
Jones, W. R. R.	80
Kato, T.	38
Kirk, R. E.	17
Klein, A. S.	6
Knothe, W. J.	42
Kondo, S.	73
Koyama, K., Ishida, T. and Nakamura, Y.	94
Krak, J. B.	43
Kühl, H.	15
Ladoo, R. B.	128
Lecrenier, A.	50
Lindsay, R. F.	81
Liptak, M.	86, 87, 88, 89, 90, 91
Lowry, T. M., and McHatton, L. P.	1
MacLellan, A. D.	110
Miller, W. J.	62
Mitchell, S. A.	119
Moldenke, E.	85
Mori, J.	36
Mullen, J. I.	111
Musiol, C.	26
Nagaya, S.	5
Nihoul, A., and Clerc, C.	129
Okazawa, T.	136
O'Neill, F.	54
Owens, T. S.	61
Parravano, N., and del Turco, C. R.	137
Passow, H.	7
Prat, L.	122
Proctor, C. H.	41
Rakusin, M. A.	138
Reutlinger, E.	95
Richmond, H. D.	49
Riddle, F. H.	97
Rie, E.	140
Rieke, R.	83
Sato, D.	126
Sauvageon, M.	112
Schuen, W.	45
Schultes, W.	141
Schwarz, R., and Brenner, A.	139
Scott, G. C.	63
Shorkey, F. A.	143
Sinnatt, F. S., Owles, A. B., and Simpkin, N.	82

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Author Index to Abstracts for November (*Continued*)

Author	Number of abstract
Soc. Auon. quartz et silice	64, 65
Soubier, L. D.	53
Springer, L.	39
Stahl, C. J.	40
Stevens, E. P.	118
Suzuki, T.	125
Swientoslawski, W.	146
Taggart, A. F., and Gaudin, A. M.	145
Takahashi, S.	37
Takamatsu, T. and Kuwayama, M.	78
Takita, I., and Wataya, M.	147
Tamman, G., and Pape, W.	135
Taylor, R. L.	21
Tippman, F.	13, 14
Trillich, H.	3
Uchida, T., and Arimoto, K.	24
Van Nieuwenburg	51
Vogel, O.	28
Wattebled, M. F.	69
West, C. J.	134
White, G. N.	96
Wikoff, A. G.	11
Wilcox, A. C.	58
Willett, A. H.	92
Willetts, H. G.	55

Art

1. **Further experiments on the measurement of color.** T. M. Lowry and L. P. McHatton. *J. Oil Colour Chem. Assoc.*, **5**, 351–3(1922).—The densities of a number of Lovibond glasses were previously measured (*Ceram. Abs.*, **1** [10], 256(1922); *ibid.*, **2** [3] 47(1923)), and curves plotted to show the relationship between density and serial numbers of a complete series of glasses. These curves were almost linear, but when extended they cut the axis of 0 density at a point on the scale of numbers corresponding to —2 instead of 0. This has been found to be due to the fact that filters of equal density at the wave-length of max. absorption of light are not equal when examd. with white light. F. A. W. (*C. A.*)

2. **Record of color research during 1922.** A. E. Bawtree. *J. Oil Colour Chem. Assoc.*, **5**, 353–6(1922).—A brief description of improvements made to the color circle used in the Bawtree colorimeter (cf. preceding abstract.) F. A. W. (*C. A.*)

3. **Color designation.** Heinrich Trillich. *Farben-Ztg.*, **28**, 1001–2(1923).—See also *Ceram. Abs.*, **2** [4], 70(1923). F. A. W. (*C. A.*)

Cement, Lime and Plaster

4. **Plaster of Paris technology.** C. Elliott. *Chem. Trade and Chem. Eng.*, **72**, 725(1923).—(1) *The effect of ht. on gypsum.* The greater part of the plaster made today is obtained by grinding the rock to a fine powder and calcining it in suitable vessels by indirect heating. In Eng. finely-ground gypsum is spread to a depth of about 6 in. in large open pans (15 to 22 ft. in diam.) provided with stirrers to agitate the mass. About 3 or 4 T. of gypsum are calcined at a time, the complete opern. from filling to emptying taking 3 to 4 hrs. . In the U. S. and Canada finely ground gypsum is calcined in large cylindrical vessels with cast-iron dished bottoms, the whole being set in brickwork and heated by a fur. placed underneath. (2) *The first and second boiling periods.* As the ground material is heated the temp. rises until at a certain point the evoln. of steam begins and this steam in rising through the material gives it every appearance of boiling. The "boiling" period represents the loss of about $^3/_4$ of the combined water, and while this is being driven off the temp. remains constant, all the ht. being utilized in vaporizing the liberated water. At the end of this "first boil" the material is mainly $CaSO_4.^1/_2H_2O$, or plaster of Paris. The temps. necessary to convert gypsum into $CaSO_4.^1/_2H_2O$ and also $CaSO_4.^1/_2H_2O$ into $CaSO_4$ depend entirely on the circumstances. The lowest temps. obtained exptly. in the lab. are 98°C and 107°C respectively, but as the time necessary is very great, temps. considerably above these are employed on the large scale in order to increase the speed of reaction. Commercially the "first boil" varies between 108°C and 130°C, while the "second boil" varies between 160°C

and 200°C. (3) *Direct heating methods.* The outside layers are protected by these parts and the ht. only slowly penetrates; the temp. at which any particular layer parts with $^3/_4$ of its water to form $CaSO_4.^1/_2H_2O$ is found approx. 100°C. This very steep temp. gradient from surface to center makes it possible to have anhydrous calcium sulphate at a dull red heat on the surface while a few mm. from the surface either $CaSO_4.^1/_2H_2O$ or even unchanged gypsum may exist. In both stationary kilns and rotary calciners the material after direct heating for a period is allowed to cool slowly, the heat absorbed by the lump slowly calcining the inner portions. Thus in kilns the heating may be 8 to 10 hrs. and the cooling 12 to 15 hrs., while in rotary kilns with smaller lumps, contact with the gases may only be for 10 to 20 mins. with cooling and "cooking" in large bins for a much longer period. (4) *Flooring and hard-finish plasters.* The most reliable information on this particular plaster is given by M. Glasenapp. Flooring plaster consists of a mixt. of a hard, sintered, cryst. modification of the anhydrite with small quantities of a segregated, vitreous, basic anhydrite holding lime in solid soln. Normal flooring plaster is best made at about 900°C and as the temp. is raised above this up to 1300° (and over) the material becomes coarser in structure and harder with increasing amts. of the basic constituent. (4) *The noncondy. of gypsum.* This table shows condy., B.t.u., transmitted per hr. per sq. ft. of surface per degree F diff. of temp.:

No. inches		B.t.u.	No. inches		B.t.u.
3	Solid gypsum slab	0.25	3	Concrete slab, 1–3–5 mixt.	0.75
4	Solid gypsum slab	.20	2½	Concrete slab	.85
5	Solid gypsum slab	.19	2	Yellow pine planks	.38
6	Solid gypsum slab	.18			

In above table, each type of material was covered with felt roofing material, but other expts. show that the corresponding fig. for 3 in. solid gypsum is 0.4 B.t.u., for 3 in. cinder concrete 1.2, and for stone concrete 2 B.t.u., when these were tested without covering. (5) *Fire-resistance of gypsum.* Expts. made on large gypsum blocks (Underwriters' Labs. in the U. S.); block used 6 in. thick, subjected to varying temps. for various temps. for various times:

4 Hrs. at 2200°F		2 Hrs. at 1900°F	
Distance from surface, inches	Temp., °F	Distance from surface, inches	Temp., °F
1	1980	1	950
2	1255	2	220
3	315	3	210
4	223	4	180
5	211	5	140
6	208	6	130

It will be noted that in the first case, although on one side the temp. of 2200°F had been maintained for 4 hrs., yet at the end of that period the temp. of the other side was only 208°F; that is, only 9½% of the heat on the fur. side had penetrated the block, while in the second case the amt. was only 6.8%. It is assumed that 10 foot lengths of gypsum, clay tile, and concrete are heated from 70°F to 1700°F by fire, then the resulting increase in length by fire would be approx.:

Gypsum	0.158 in.
Clay tile	.590 in.
Concrete	1.180 in.

Obviously this slight expansion in the case of gypsum is not sufficient to cause injury to either the material itself or the structure. O. P. R. O.

5. On the crushing strength of concrete and proportion of its materials. Shukichi Nagaya. *J. Jap. Cer. Assoc.*, **366**, 75–9(1923).—The paper may be regarded as summary of author's repts. which have been published since 1918. 1. *Amt. of water.* (*a*) Amt. of water used in concrete must be expressed in per cent of total amt. of cement and sand. (*b*) Excess of water reduces the crushing strength; the decrease per vol. per cent of water is about 100 lbs. per sq. in. for Port. cement-sand-gravel concretes. (*c*) The excess of water is the most usual cause of air cracking. The author has observed cracking due to blowing of cement in concrete construction only once in his career. (*d*) The effect of excessive water is more serious in concretes with volcanic ashes or diatomaceous earth, as they absorb much water. 2. *Propn. of sand.* The crushing strength of concrete depends chiefly on the nature of its mortar; the effect of varying propn. of gravel is very slight within wide range. Concrete with 1:3 mortar can never be as strong as that with 1:2 mortar. 3. *Aging.* Concrete with a cement which has been stored for 6 months is at least 10–20% weaker than that with fresh one. (Failures in concrete structures frequently owe to an old cement which causes unintimate mixing of materials and also makes the concrete porous.) The author proposes the use of Port. cement without testing. S. K.

6. Upright (lime) kilns. A. S. Klein. *Rev. Mat. Constr. Trav. Pub.*, **164**, 100–102 (1923).—Some general remarks on the opern., thickness of bed, size of raw material, massing of material during heating, height of kilns and ventilation. L. N.

7. Free lime in a Portland cement clinker. H. Passow. *Zement*, **12**, 143–5 (1923).—Quartz sand acts as an inert material when mixed with a Portland cement clinker. Blast-furnace slag when mixed with the clinker causes an increase in the amt. of free lime formed during the initial hardening. R. F. S. (*C. A.*)

8. Free calcium hydroxide in hardened Portland cement. Goslich. *Zement*, **12**, 149–50(1923).—A sample of hardened Portland cement was exposed to moist air for 6 days. It was then dried at 90° and ground to a fine powder. The sample was fractionated by a suspension analysis into the following portions: 1.78% heavier than 2.84 (sp. gr.); 40.72% between 2.84 and 2.7; 25.25% between 2.7 and 2.6; 16.53% between 2.6 and 2.44; 7.81% between 2.44 and 2.23; and 7.93% lighter than 2.23. This latter portion should contain all the free $Ca(OH)_2$, since $Ca(OH)_2$ itself has a sp. gr. of 2.078. The analyses of the fractions show that the lighter portion contains 12% excess CaO. This represents 0.95% of the total cement and indicates that free CaO is not formed during the hardening period. R. F. S. (*C. A.*)

9. How much water is chemically combined in a hardened Portland cement? Goslich. *Zement*, **12**, 163–5(1923).—Test specimens were made with 100 g. cement and 26 g. distd. water. These were stored in a moist closet. Samples were analyzed at various intervals from 1 hr. to 28 days after the mixing with water. The combined water was detd. as follows: The samples were powdered and dried to const. wt. at 90–5°. Two g. were ignited to const. wt. The loss in wt. minus the loss due to the volatile matter as previously detd. is the chemically combined water. In one cement 1.63% H_2O had combined at the end of the first hr. The amt. combined gradually increased to 13.36% at the end of 28 days. R. F. S. (*C. A.*)

10. Acid-proof cements. Anon. *Chem.-Ztg.*, **47**, 504(1923).—Water glass is a component of practically all acid-proof cements. Complete drying out and a thorough fixing of the cement after drying are essential. Usually this fixing is carried out with a dil. acid applied in repeated coats. Alkalies are harmful to these cements, and no cement is known equally resistant to both acids and alkalies. W. C. E. (*C. A.*)

11. Manufacture and application of lightweight concrete slabs. A. G. Wikoff.

Chem. Met. Eng., **28**, 975–6(1923).—A mortar is made with 3 parts of cement, 1 of sand and 7 of a material which is solid at ordinary temp. but melts in hot water. This latter material is formed into pellets before mixing with the cement and sand. The mortar is molded into slabs which are reinforced and allowed to set. After setting the pellet material is removed by heating and steam-distg. The slabs are 24 x 32 x $1^1/_8$ in. and weigh 30 lb. They are porous, strong, and resistant to the effects of heat and steam.
R. F. S. (*C. A.*)

12. The properties of Portland cement. H. Burchartz. *Zement*, **12**, 186–7, 193–5(1923).—A tabulation and discussion of the results of phys. tests on 110 samples of Port. cement. R. F. S. (*C. A.*)

13. Determination of the suitable fineness of grinding of materials used in the manufacture of cement. F. Tippmann. *Zement*, **11**, 541(1922); *Chimie et industrie*, **9**, 1187(1923).—Blast 3–4 g. of the material for 10 min. in an old Pt crucible so as to form a completely fused clinker which is evenly colored a blackish green after cooling. Brown, yellow, or even white spots, observable with a magnifying glass, clearly indicate that the material was not ground sufficiently fine. If the temp. is raised above the softening point there are formed fissures having a whitish green color, which might lead to false conclusions. A. P.-C. (*C. A.*)

14. The fine grinding of cement raw mix. F. Tippmann. *Zement*, **12**, 150–1 (1923); cf. *C. A.*, **17**, 2484.—Extreme fineness is not necessary for cement raw mix, provided the clinker is thoroughly sintered. R. F. S. (*C. A.*)

15. Fineness of raw mix, strength, and impact test. H. Kühl. *Zement*, **12**, 155–8, 174–7(1923).—A review and discussion with a bibliography. R. F. S. (*C. A.*)

16. A new application of the electric furnace. Fused aluminous cement. A. Brissaud. *Science et industrie*, **6**, 83–6(1922); *Chimie et industrie*, **9**, 1187(1923).—A description of the manuf. of fused aluminous cement in the elec. furnace. Furnaces of 1,000–2,000 h. p. are used, giving 25–40 tons a day. The cement is tapped every 3–4 hrs. Power consumption is 1,000–1,400 kw.-hr. per ton. There is considerable wear of the electrodes, owing to the action of the CO_2 from the limestone, atm. O, and oxides, and mechanical abrasion during charging. (Cf. J. Bied, *Jour. Amer. Ceram. Soc.*, **4** [4], 317(1921); *Ceram. Abs.*, **2** [5], 91(1923); E. Candlot, *C. A.*, **16**, 1845.)
A. P.-C. (*C. A.*)

17. The manufacture of Portland cement from marl. R. E. Kirk. Univ. Minn. Eng. Expt. Sta., *Bull.* **2**, 52 pp.(1923).—Portland cement can be made from marl and clay, of as good a quality as that made from any other raw materials. The origin of marl, its chem. compn., and the quality and quantity available in Minnesota are discussed. Plant operations are taken up in detail. R. F. S. (*C. A.*)

18. An untrodden field in lime research. O. Bowles. *Concrete* (Mill Section), **23**, 127(1923).—Limes vary greatly in their physical properties and chem. activities such as plasticity, rate of slaking, or rate of settling as milk of lime; these variations in many instances bear no relation to the chem. compn. of the original limestone. A definite relationship undoubtedly exists between the character of the lime and the physical properties of the parent limestone, but little serious effort has yet been made to correlate them. J. C. W. (*C. A.*)

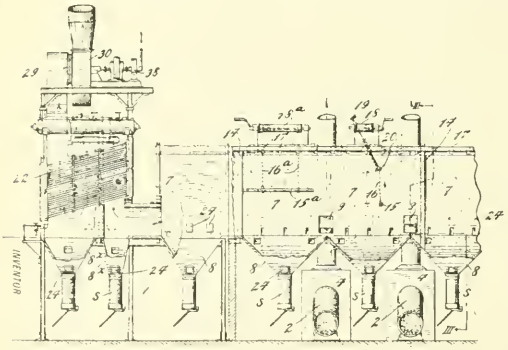
19. Energy of crystallization of calcium sulfate dihydrate, and "regenerated" gypsum. M. von Glasenapp. *Zement*, **11**, 365–7(1922).—The complete conversion of 2 $CaSO_4.H_2O$ into the dihydrate requires only a little more than the theoretical amt. of water. In consequence of the increased crystn. pressure the regenerated gypsum has a more flaky structure than the natural mineral and is also notably harder than the latter. J. S. C. I.

PATENTS

20. Artificial stone, cements, etc. H. BERRY. Brit. 189,892, Sept. 13, 1921. Waste slate, coal shale, granite, broken bricks, clinker, slag, or any Al silicate, or sand, quartz, flint, or other form of SiO_2 is powd. and mixed with MgO, and with either tartaric acid or the carbonates, hydrates, or bicarbonates of Na, K, or NH_4, or mixts. of these. 1–2% of sol. silicates may be added to the alk. substances, or the finished product may be soaked in a sol. silicate soln. Traces of Ba or Sr salts, with or without NH_4 salts such as the chloride, sulfate or phosphate may be added, and an addn. of 1–2% of a sol. Mg salt, preferably the sulfate, may also be made. The magnesite is preferably calcined at 300–600° in an atm. of steam, any distillate being collected and added to the compn. A typical compn. consists of powd. slate 85, MgO 10, $^1/_2$ part of Ba compd. 0.5 and $NaHCO_3$ 5 parts. The product may be used for flooring or molded articles, or if mixed with asbestos, slag wool, or the like, as an insulating covering. Cf. *C. A.*, **17**, 2486. (*C. A.*)

21. Building brick and process of making same. ROBERT L. TAYLOR. U. S. 1,462,991, July 24. The process of making building blocks or the like consisting in first crushing ferro manganese slag to a proper consistency, mixing the mass with water to form an intimately associated plastic mixt., holding unitary portions under pressure, and then subjecting the compressed and molded units to steam and drying them, substantially as set forth. A building block or the like composed principally of ferro manganese slag.

22. Manufacture of building blocks and bricks. FRANK CORDERY. U. S. 1,465,115, Aug. 14. As a new article, a building block composed of dried out pulverized slag, Port. cement and magnesium chloride.



23. Cement-kiln system. DAVID S. JACOBUS. U. S. 1,463,363, July 31. App. for treating dust-laden cement kiln gases, comprising a flue arranged to permit a current of dust-laden gases to flow substantially unobstructedly therethrough without substantial change in the general direction of flow in its passage through said flue, said flue having refractory heated side walls exposed to the current of gases for the collection of a caking material, and a plurality of baffles projecting a short distance from each of said side walls at spaced intervals along the length of the flue and adapted to cause eddies in the current to bring different portions of the gases into contact with the side walls, said side walls being accessible for cleaning while the app. is in opern.

Enamel

24. Study of acid-resisting enamels. TOKIJI UCHIDA AND KAZUO ARIMOTO. (The Osaka Indus. Lab.), *Bulletin* **4** [1], 68 pp.(1923).—The influences of variation in the compn. of enamel-frits upon their resist. to sulphuric acid have been detd., starting from standard frits which contain basic flux (Na_2O, $^1/_3Na_3AlF_6$ or PbO), refrac. base ($^1/_3Al_2O_3$, CaO, ZnO, BaO or MgO), acid flux (B_2O_3) and refrac. acid (SiO_2, TiO_2 or ZrO_2) in the ratio of 1.0:0.6::0.5:2.4. The soly. was compared by putting 2 g. of frit with fineness of 900–1000 mesh per sq. cm. in a weighing bottle contg. 10 cc. of 10% sulphuric

acid and by leaving them for 48 hrs. at 20° C under normal press. 1. *Effect of basic fluxes on resist. to acid.* (1) Their effect is practically similar, but soda is better than cryolite or lead oxide. (2) An excess of cryolite causes difficulties in melting as it badly corrodes the pot, while too small propns. make the frit too refrac. The best result is obtained with 0.8 equivalents. 2. *Effect of refrac. base on resist. to acid.* (1) The effect is very marked. The best result is obtained with barium oxide followed by magnesium oxide. Oxides of zinc, aluminium and calcium are detrimental. (2) The series 0–1.0 $BaO.{}^1/_3Na_3AlF_6.0.5B_2O_3.2.4SiO_2$ is least sol. at 0.3BaO. 3. *Effect of acid flux on resist. to acid.* The resist. is reduced by an increase in boric acid. $0.3B_2O_3$ is most suitable, since a smaller content makes the frits too refract. 4. *Effect of refrac. acid on resist. to acid.* (1) The effect is remarkable. Only silica is satisfactory among the 3 acids. (2) The resist. increases as the content of silica rises. 5. *Effect of mutual replacement of base and acid on the resist. to acid.* (1) Expts. on series 1.0–0BaO or MgO. 2.0 $-3.0SiO_2.{}^1/_3Na_3AlF_6.0.5B_2O_3$ show that good frits are obtainable only in some definite ratios of the base and the acid, 0.6BaO or $MgO:2.4SiO_2$ being best for the series. (2) Soly. of series 0.6–1.5 ${}^1/_3Na_3AlF_6.0.9–0B_2O_3.0.6BaO.2.4SiO_2$ decreased with the content of cryolite. Considering the difficulties caused by its corrosive action on pot, the propn. 1.0 ${}^1/_3Na_3AlF_6:0.5B_2O_3$ seems to be most suitable. 6. *Production of the best frit.* Since the expts. hitherto described have indicated that Na_2O, B_2O_3, BaO and SiO_2 are most desirable constituents of acid-proof enamels, the authors then started to find their best propn., keeping the ratio of fluxes and refract. oxides at 1.3:3.7 in equivalents and also the contents of soda and boric acid as 1.1 and 0.2 respectively. The best frit thus obtained is $0.3BaO.3.4SiO_2.1.1Na_2O.0.2B_2O_3$. The frit loses only 0.28% in the test, and is quite satisfactory in other respects, such as melting point, burning luster, burning color and adherence to iron. S. K.

25. Study of cast iron enamels. Yutaka Fukudo. (The Osaka Indus. Lab.), *Bulletin* **4** [2], 43 pp.(1923).—The process of enameling cast iron ware in single coat is described. 1. *Raw materials used in the expts.* Cast iron pieces contg. 2.51% carbon, 1.99% silicon, 0.10% sulphur, 0.06% phosphorus and 0.34% manganese were employed. Enamel materials were quartz, red lead, cryolite, soda-ash and sodium nitrate. 2. *Effect of cast iron.* Four kinds of cast iron, ranging in the content of carbon from 2.58 to 3.13% gave almost same results for same glazes. 3. *Effect of fusibility of enamel.* 510°C is the most suitable m. p. for the purpose. 4. *Effect of coeff. of expansion.* Expts. with 35 diff. batches show that enamels with expansion-coeff. of 0.0000220–0.0000280 are most suitable. 5. *Effect of opacifier.* Cryolite makes an enamel fragile when it is used in excess of 15%. If stannic acid is used, it should be introduced to an enamel when its frit is ground. 6. *Effect of glazing process and time of firing.* Employing an enamel as $\left\{\begin{matrix} 0.112\ Na_2O \\ 0.337\ PbO \\ 0.551\ {}^1/_3Na_3AlF_6 \end{matrix}\right.$ $\left.\begin{matrix} \\ 1.242\ B_2O_3, \\ 1.526\ SiO_2 \end{matrix}\right\}$ composed of 25 quartz, 20 red lead, 40 boric acid, 10 cryolite and 5 sodium nitrate, the author got the best results when the enamel was fired at 750–770°C for 30–10 secs. after applying its dry powder on hot test pieces, previously heated at above temps. for 2–4 mins., or when the enamel was fired at 800–820°C for 40–10 secs. after applying its powder on hot test pieces which had just been heated at the same temps. for 1–3 mins. 7. *Surface-treatment of cast iron body.* Surface-decarbonization of cast iron prevents the bubbling of enamel. A very excellent result was obtained with test pieces which had been coated with ferric oxide, manganese dioxide or sodium nitrate, placed in a muffle, heated to 850°C and then cooled very slowly. 8. *Colored enamel.* The batch described in 6 gave excellent colored enamels when suitable amts. of colorants had been used. For example, 3 copper oxide, 3 chromium oxide, 3 manganese dioxide and 0.5 cobalt oxide pro-

duce a light sky blue, a dark green, a dark brown and an indigo blue respectively.
S. K.

26. Correct notions on fluoride enamels. CHARLES MUSIOL. *Chimie et industrie*, **9**, 872–87(1923).—A mathematical criticism of the theories of Vogt, Gruenwald, and Mayer and Havas (*Sprechsaal*, **1911**, No. 1) based on the analyses published by these authors. It is shown that F is not volatilized as SiF_4, that when B_2O_3 is present F is probably volatilized as BF_3 (this would require to be confirmed by analysis of the gases evolved), and that Mayer and Havas' results abound in errors, either clerical or analytical. A method is given for calcg. the compn. of the enamel from that of the initial mixt. Seger's formula is worse than useless. The relationship between the various constituents should be studied by means of the centesimal mol. compn.
A. P.-C. (*C. A.*)

27. The effect of enamel on the transmission of heat. A. H. GIBSON, F. C. LEA AND EZER GRIFFITHS. *Repts. Light Alloys Sub. Comm., Advisory Comm. for Aeronautics*, No. **5**, 61–90(June, 1921); *J. Inst. Metals*, **28**, 632.—The rate of flow of heat from a rough cast Al surface to the air or to water is considerably improved if the surface is coated with a smooth enamel. A large no. of tests showed that the best results are obtained with a hard, smooth, stoved enamel, which increases the rate of transmission of heat from a rough cast Al alloy surface to air by 15% and to water by 4 to 8% from cast iron to air by 7% and from steel to air by 2%. No effect is produced on Cu.
H. G. (*C. A.*)

PATENTS

28. Pickling bath for iron. O. VOGEL. U. S. 1,460,395, July 3. A pickling bath for Fe is formed of H_2SO_4 or other acid soln. contg. about 1% quinoline or one of its derivs. to prevent the metal from becoming brittle. (*C. A.*)

29. Removing rust from metals. J. S. GRAVELY. U. S. 1,459,910, June 26. Rust is removed from articles of ferrous metal or Ni-plated ware by treating them with a soln. of NH_4 citrate or other org. NH_4 salt, and then, after a lapse of time, washing off the slime produced. (*C. A.*)

Glass

30. Color given to glass by tungsten. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **370**, 302–9(1923).—Coloring action of sodium para-tungstate ($Na_{10}W_{12}O_{41}.28H_2O$), tungsten trioxide and metallic tungsten on glasses with formulas of $R_2O.RO.3SiO_2$ and $R_2O.RO.0.5B_2O_3.3SiO_2$, also effect of oxidizing agent and arsenious acid on the action of the sodium tungstate have been studied. Results of 142 meltings and effect of reheating these glasses are described. *Results.* (1) Sodium tungstate or tungsten trioxide mixed in glass-batches produces no particular color. (2) Metallic tungsten produces very often a yellow or an orange in glass. Similar coloration is rarely observed when sodium tungstate or tungsten trioxide is used. Metallic tungsten gives often a gray to glass. Melting of a batch with metallic tungsten will result in the production of a system as $xW + yWO_3 + zNa_2(K_2)WO_3$ + glass. Presence of the yellow oxide will color the glass yellowish. Suspension of tungsten or its blue oxide will give a gray to the glass. (3) Sodium tungstate has a tendency of producing alabaster effect or opacity, especially in glasses free from boric acid. The tendency is also observable in metallic tungsten and its oxides, though it is very weak. The phenomenon is probably due to fine suspension of tungsten oxides. (4) Sometimes, an excess of tungsten salts, its oxides or metallic tungsten produces gall on surface of glass or massive ppt. at the bottom. They consist of sol. tungstates of alkali metals. (5) Introduction of sodium tungstate accompanied by an oxidizing agent or arsenious acid produces no

particular color. (6) Salts or oxides of tungsten can be used as opacifiers but not as colorants. S. K.

31. Manganese compounds as glass colorants. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **366,** 80–97(1923).—Coloring action of manganese compds. on various glasses have been studied. Formula of basal glass was $R_2O.RO.3SiO_2$, $R_2O.RO.0.5B_2O_3.3SiO_2$ or $1.3R_2O.RO.6SiO_2$ in which R_2 and R represent Na or K and Ca, Mg, Zn, Ba or Pb respectively. Results of 591 meltings with 100–150 g. or 1 kg. batch are described. 1. *Manganese dioxide.* According to MEYER and ROETGERS, this oxide is dissociated into Mn_2O_3 at 530°C in air. Generally speaking, soda-glass has pink shades and is not so clear as potash-glass, although these differences disappear at higher intensities. PbO encourages the coloring. It is very likely that MnO_2 is decomposed to $xMn_2O_3 + yMnO + zMnO_2$ in the melting. The propn. of these 3 oxides and also the color are affected by the constituents of glass. 2. *Manganous oxide.* Almost colorless, yellow or blue glass is obtained when such amt. of MnO which will produce light purple or pink with MnO_2 are used. 3. *Manganous carbonate.* Its action is similar with that of MnO. Thus the pink or purple does not owe to MnO, but to higher oxides, probably Mn_2O_3. 4. *Manganese dioxide and nitrate of potash or soda.* These nitrates favor the coloring in most cases. 5. *Manganese dioxide and potassium tartrate.* The reducing agent counteracts to the dioxide in most glasses. 6. *Manganese dioxide and arsenious acid.* Arsenious acid acts generally to reduce the coloration of MnO_2 markedly. 7. *Manganese dioxide, arsenious acid and nitrate of potash or soda.* The colors seem to be affected by complex reactions which occur in melting. MnO_2 remaining in the resulting glass will produce a brown and Mn_2O_3 will color it pinkish purple or purple, while MnO has no coloring action. S. K.

32. Coloring action of molybdenum on glass. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **367,** 129–31(1923).—Action of molybdenum as glass colorant was studied by adding 1.0–7.5% of ammonium molybdate to 20 different glasses with formulas of $R_2O.RO.3SiO_2$ and $R_2O.RO.0.5B_2O_3.3SiO_2$. *Results.* (1) Molybdenum causes no particular coloration; (2) glass with molybdenum has very often been opacified by reheating. This property is closely related with its compn.; (3) the molybdate in excess of about 5% is sepd. as white gall on its surface or as grains at its bottom; they are chiefly composed of alkali molybdates. S. K.

33. Color imparted to glass by chromium. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **368,** 192–6(1923).—Coloring action of chromium on glasses with formula of $R_2O.RO.3SiO_2$, $R_2O.RO.0.5B_2O_3.3SiO_2$, $1.3R_2O.RO.6SiO_2$ or $R_2O.B_2O_3.6SiO_2$ is reported. Chromium has been introduced in the forms of Cr_2O_3, $K_2Cr_2O_7$ and K_2CrO_4. Influence of potassium nitrate and potassium tartrate on color given by Cr_2O_3 has been studied. *Conclusions.* (1) Generally speaking, chromium compds. impart yellowish green colors to glasses. Compn. of glass affects its shade in yellow; *i. e.*, 0.05% of Cr_2O_3 introduced in batches as such give a green to $Na_2O.CaO.0.5B_2O_3.3SiO_2$, while $Na_2O.CaO.3SiO_2$ is colored light yellowish green. (2) Colors given by $K_2Cr_2O_7$ are richer in yellow than those given by Cr_2O_3, K_2CrO_4 being intermediate in this respect. (3) Addn. of oxidizing agent to a batch contg. Cr_2O_3 encourages the yellow tint, while reducing agent acts to reduce it. It may owe to green coloration by Cr_2O_3 and a yellow one by CrO_3, or it may be ascribed to the action of these agents on iron oxides. S. K.

34. Color given to glass by vanadium. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **369,** 236–40(1923).—The influence of compn. of glass on its color given by vanadium oxide, V_2O_5, which was added to batch with or without oxidizing agent (potassium nitrate), reducing agent (potassium tartrate) or arsenious oxide, has been detd. The basal glass was $R_2O.RO.3SiO_2$ or $R_2O.RO.0.5B_2O_3.3SiO_2$. The results can be summarized as follows: (1) Generally speaking, color given to glass by vanadium oxide resembles

that imparted by Cr_2O_3, though the latter has stronger tint in yellow than the former. (2) The color is not influenced by compn. of glass. In general, boric acid encourages the coloration. (3) Oxidizing agent added to batch causes a slight increase in yellow, while reducing agent and arsenious acid tend to act the other way. Color of vanadium glass may chiefly owe to V_2O_3 and this may be partly oxidized to V_2O_5 which may be a yellow colorant of glass. (4) V_2O_5 can be used for Cr_2O_3, though it is too expensive for usual purpose. S. K.

35. Color given to glass by antimony oxide. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **369**, 241–2(1923).—Coloring action of antimony oxide on glass was studied by introducing 10–30% of Sb_4O_6 to glasses with compn. of $1.3R_2O.RO.6SiO_2$ and $R_2O.B_2O_3.6SiO_2$ with the result that the oxide does not cause any particular coloration, and also that reheating of glasses, which have high contents of antimony oxide, in a gas-fired kiln usually produces iridescent effect, light grayish black to black in color, on their surface. S. K.

36. On the thermal expansion of soda-lead glass. JIRO MORI. *J. Jap. Cer. Assoc.*, **368**, 176–80(1923).—Linear expansion of soda-lead glass, completely free from stress, has been detd. at 30° and 100°C. The max. difference between the observed linear expansion and that calcd. by the aid of SCHOTT'S coeff. amts. to 12%, while they agree very well only in glasses whose formulas are close to $6SiO_2.1.0PbO.1.0Na_2O$. The author has obtained the following coeff. for linear expansion for lead oxide and soda, taking 0.05, 1.53, 1.53 and 0.45 as those of silica, lime, alumina and magnesia resp.: PbO 0.938 and Na_2O 4.70. The next tables show chem. compns. and coeffs. of linear expansion of glasses used in the expts.

TABLE I.—ANALYSES OF THE GLASSES

No.	PbO	Na_2O	Al_2O_3	CaO	MgO	SiO_2
10	44.73	4.61	0.72	0.07	0.05	49.82
8	41.83	5.61	1.23	trace	.09	51.21
6	39.24	6.90	1.14	0.10	trace	52.61
4	37.45	7.88	0.96	.10	0.03	53.58
2	36.60	8.27	.97	.06	trace	54.10
0	33.96	10.02	1.09	.08	0.01	54.84
1	31.57	11.35	1.15	.04	.02	55.87
3	28.01	12.40	0.98	.09	trace	58.52
5	24.33	13.83	1.19	.33	0.02	60.30
7	22.94	14.06	1.15	.18	trace	61.67
9	16.35	16.34	1.15	.14	0.07	65.95

TABLE II.—FORMULAS AND LINEAR COEFFICIENTS OF EXPANSION

No.	Formula	Observed coeff. $666(\times 10^{-8})$	Calcd. coeff. $678(\times 10^{-8})$	Diff. $+8(\times 10^{-8})$
10	$6SiO_2.1.5PbO.0.5Na_2O$			
8	$6SiO_2.1.4PbO.0.6Na_2O$	705	704	— 1
6	$6SiO_2.1.3PbO.0.7Na_2O$	729	739	+10
4	$6SiO_2.1.2PbO.0.8Na_2O$	761	764	+ 3
2	$6SiO_2.1.1PbO.0.9Na_2O$	781	776	— 5
0	$6SiO_2.1.0PbO.1.0Na_2O$	844	836	— 8
1	$6SiO_2.0.9PbO.1.1Na_2O$	880	877	— 3
3	$6SiO_2.0.8PbO.1.2Na_2O$	903	892	—11
5	$6SiO_2.0.7PbO.1.3Na_2O$	934	933	— 1
7	$6SiO_2.0.6PbO.1.4Na_2O$	929	929	0
9	$6SiO_2.0.5PbO.1.5Na_2O$	966	975	+ 9

The coeff. is on the whole a function of chem. compn. However, as indicated in the latter table, it does not follow the additive law exactly. This fact causes diffs. which are a little larger than exptl. errors. S. K.

37. Cracking and corrosion of glass pots. SANGORO TAKAHASHI. *J. Jap. Cer. Assoc.*, **367**, 149–53(1923).—Descriptions or discussions on life of pots due to cracking, manner, cause and prevention of cracking, life due to corrosion, its manner, cause and prevention are given with photographs. According to statistics for 3 yrs. at the Tokio Elec. Co., most of cracks in covered pots have grown vertically at their inside. This kind of cracking is probably caused by the side pressure of molten glass which favors the growing of vertical minute cracks produced together with those of other directions during the period of filling. Sometimes they are cracked in various directions inside or outside of pot, usually during the period of tempering the pots in pot-arch or before filling batch in the placed pots. Pots should be tempered at least to 1300°C. Corrosion by usual batch contg. 50% of raw materials was far more severe than that by simple cullet batch, indicating that pots are chiefly corroded by fluxes in raw materials before complete melting which takes about 10 hrs. Iron contd. in batch and pot is detrimental in regard to corrosion, especially for lead glass, because it produces metallic lead and ferrous silicates. Excess of flux in raw materials or use of arsenious acid causes sometimes honey-combed corrosion. As conclusion, the author recommends the use of porous pots lined with such a material which will produce sillimanite on using. S. K.

38. On the test of chemical glasses. TORAO KATO. *J. Jap. Cer. Assoc.*, **367**, 138–49(1923).—Detailed descriptions are given on the existing specif. for glass vessels for use in chem. lab. Then the results of an elaborate expt. with beakers and various flasks made by several Jap. manuf. are described. As conclusions, he proposes the adoption of the foll. methods in the testing of chem. glasses. Preliminary treatment: Wash the sample with distilled water after rinsing it well with a soln. of potassium bichromate in concd. sulphuric acid. 1. *Tests for endurance of sudden heating.* (1) Heat the vessel at least to 120°C in an air bath and then immerse it neck foremost in water of 15°. (2) Boil the vessel contg. conc. soln. of calcium chloride whose sp. gr. is 1.33 at 15° for 5 min. on an asbestos plate and immerse it in water of 0°. (3) Put the vessel which has been $^3/_4$ filled with paraffin on an asbestos plate heated by a bunsen burner, take off the heat source, read the temp. and dip it in water of 15° for a moment. The process should be repeated every 5° till it is cracked. Mean value of about 3 samples must be reptd. for temp. over about 160°. 2. *Tests for resistance to water and reagents.* (1) *Water.* Boil distilled water in the vessel which is kept three-quarters full with it for 6 hrs. Loss in wt. should be expressed in mg. per 100 sq. cm. (2) *Acid.* The vessel three-quarters filled with 12% HCl is kept boiling for 3 hrs. The loss is expressed as described above. Its appearance must be inspected. (3) *Alkali.* Same to (2), except that 2% soln. of NaOH is used as reagent. 3. *Test for dissolved alkali.* The water obtained in the test B (1) is tested by rosolic acid for the presence of alkaline reaction. *Standards.* 1. *Endurance of sudden heating.* (1) The neck must remain uncracked. (2) The sample should stand the test. (3) The breaking temp. must be over 140° in beakers and conical flasks and over 130° in round flasks. 2. *Resistance to water and reagents.* (1) *Water.* The max. allowable loss is 5 mg. (2) *Acid.* The max. allowable loss is 5 mg. The testing must cause no change in the appearance. (3) *Alkali.* The max. allowable loss is 30 mg. The boiling must cause no change in the appearance. 3. *Dissolved alkali.* No alkali must be detected. S. K.

39. The staining and etching of glass. L. SPRINGER. *Glasshütte*, **52**, 289; **53**, 277(1922–3). See *Ceram. Abs.*, **2** [2], 23(1923). J. B. P. (*C. A.*)

(1923).—The mixing, shaping, firing and polishing are described. J. B. P. (*C. A.*)

40. Flattening stones. C. J. STAHL. *Glashütte*, **53**, 307, 323–5, 339–41, 355–6

41. The electrodeposition of silver and copper on glass. C. H. Proctor. *Glass Ind.*, **4**, 61–3(1923). J. B. P. (*C. A.*)

42. Graphic check on glass-works operation. Walter J. Knothe. *Glass Ind.*, **4**, 83–5(1923). J. B. P. (*C. A.*)

43. Avoiding errors in the analysis of glass sand. J. B. Krak. *Glass Ind.*, **4**, 103–4(1923). J. B. P. (*C. A.*)

44. The basic glasses industry. A. Bigot. *Chimie et industrie*, **9**, 851–62(1923).—A review of the prepn., properties and uses of artificial basic silicates, describing more particularly B.'s methods and equipment and the properties of his products. A. P.-C. (*C. A.*)

45. An electric furnace for the melting of quartz goods. W. Schuen. *Keram. Rundschau*, **31**, 12(1923); *J. Soc. Glass Tech.*, **7**, 47; cf. *C. A.*, **17**, 2176.—Quartz was melted to a cylindrical mass round an electrically heated carbon tube. At the stage of development attained, only pieces of quartz so shaped could be worked and then by processes adapted from the glass industry. The elec. resistance consisted of a tube of 1 m. length, 35 mm. external diam., and 25 mm. internal diam., made of the purest electrode C. At each end of the tube an electrode consisting of a thick block of C was adjusted to make good elec. contact with it. The electrodes were surrounded by strong Fe bands, and the cables were joined to the electrodes by detachable strong Fe connecting pieces. The resistor and electrodes were built into a furnace capable of rotation. The furnace consisted of a strong Fe cylinder lined with a glazed fire-clay cylinder. Asbestos was placed between the Fe shell and the electrodes to prevent short-circuiting. Only a. c. could be used. The voltage was 40 and the current 800 to 1000 amp. In 20 minutes 18 to 23 kg. of sand could be melted with a current consumption of 7.5 to 8 kw./hr. Sketches of the furnace are given. A piece of waste quartz tube was slipped over the carbon resistor. Sand was then filled in to such a height that the top electrode could not rest on the edge of the furnace but rested on top of the sand. The silica and the carbon reacted, with the formation of Si carbide and CO_2. Any gas developed could escape only with difficulty and so a protective layer was formed between the glowing resistor and the soft quartz. To counteract the high gaseous pressure, a hand-operated lever was used to maintain elec. contact between the resistor and the electrodes. The melting process was concluded in 20 to 30 minutes and then the quartz had to be worked quickly. H. G. (*C. A.*)

46. Gas-producer heat balances. W. B. Chapman. *Glass Worker*, **42** [39], 11, 18, 20(1923); *Glass Ind.*, **4**, 123–6(1923).—A pyrometer recording the sensible heat of the producer gas is recommended as an aid to correct producer operation. A heat balance is offered as a tentative standard compiled from tests of 12 different installations of mech. producers of 4 different makers. J. B. P. (*C. A.*)

47. The action of water and steam under pressure on some soda-lime-silicate glasses. P. W. Hodkin and W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 291–308 (1922).—Four soda-lime-silicate glasses having the approx. compns. $6SiO_2.0.3CaO.1.7Na_2O$, $6SiO_2.0.7CaO.1.3Na_2O$, $6SiO_2.0.8CaO.1.2Na_2O$, and $6SiO_2.CaO.Na_2O$ were subjected to the action of water and steam at pressures varying from 2 to 25 atms. above normal. The action of steam on these glasses is considerable, being greater than that of water at the higher pressures in the case of the glass having the lowest lime content. Corrosion diminishes as the amt. of lime is increased and the amt. of Na_2O decreased. The glass with the highest lime content was unattacked by steam or water in 3 hrs. at 2 to 4 atms. The incrustation formed as a result of corrosion was harder the greater the lime content; a gelatinous layer was formed beneath the incrustation on the glass contg. only 0.3 CaO at 15 atm. pressure. Since the loss in weight recorded was less

than the total alkali found in the water, it is clear that the glass absorbs a considerable quantity of water. The character of the corrosion, which clearly brings out pouring and molding lines, is influenced markedly by the condition of the surface. The autoclave test is considered too severe for soda-lime-silicate glasses which are only required to resist the action of boiling water. Cf. *Ceram. Abs.*, **1** [12], 329(1923).

J. C. S. (*C. A.*)

48. The diphasic nature of glass, as shown by photo-elastic observations. L. N. G. Filon and F. C. Harris. *Proc. Roy. Soc.* (London), **103A,** 561–71(1923); 3 figs., tables.—A specimen of flint glass was heated slowly to 400° and then subjected to a longitudinal pressure of 130.6 bars. The full load was left on for 42 hrs. and then the specimen was allowed to cool slowly under this pressure; the process took 7 hrs. The load was removed and the specimen examd. in Na light between cross Nicols with the aid of a Babinet compensator. The black band indicated a stress difference which was quite considerable and remained of the same sign throughout a cross-section of the specimen. This band extended up to the edge, excluding a possible "skin effect" as the source of a balancing stress. The conclusion, after a mathematical analysis of the results, is "that a portion of the stress is not optically shown. It necessarily follows that the material cannot be homogeneous, but must consist of at least 2 components or 'phases.'" "Further these phases must have different stress-optical coefficients." The stress-optical coeff. for the heavy flint glass in question only changed from 2.31 brewsters to 2.24 brewsters during the above treatment. "It would thus appear that the heat treatment has produced practically no change in the concn. of the disperse phase, so that the phases have not sepd. out, but have been present in the glass from the beginning." An extra-dense flint examd. in the same manner gave positive values for the longitudinal stress, whereas these values were negative in the case of the heavy flint glass. From the above fact, the conclusion is that the "crypto-stress" is an effective pressure in the case of the extra-dense flint. It is suggested that according to Wieners' hypothesis if the particles of the disperse phase are small compared with the wave-length of light, the double refraction due to stress would be largely influenced by change of shape and orientation of the dispersed particles. Further expts. are in progress.

G. E. B. (*C. A.*)

49. The action of potassium carbonate on lead glass. H. D. Richmond. *Analyst,* **48,** 260–2(1923).—A sample of K_2CO_3 taken under the Sale of Food and Drugs Acts showed 10 parts of As and 80 parts of sol. Pb per million. Scrapings from the walls of the same bottle gave 12 pts. As and 500 pts. Pb per million. The bottles contained 0.34% of As_2O_3 and 13.1% PbO. It was proved by expt. that K_2CO_3 contg. 16.6% of moisture gave no increase of lead content in six weeks when kept in a "well closed lead-glass bottle." A sample of K_2CO_3 originally carrying less than 5 pts. per million of lead stored for 9 weeks in a lead-glass bottle with "very imperfect" closure contained 20.5% moisture and 150 pts. per million of lead at the end of the time. The result is attributed to the formation of a liquid phase on the surface of the crystals which acts on the bottles. It is recommended that K_2CO_3 be not stored in lead-glass bottles.

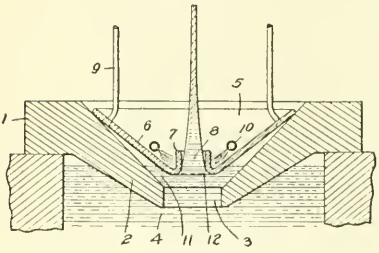
G. E. B. (*C. A.*)

50. Chemical glass and hard glass. Ad. Lecrenier. *Bull. federation ind. chim. Belgique,* **1922,** 225–34; *Chem. Zentr.,* **1922,** IV, 30.—Besides numerous data on the glass works of the Val St. Lambert, the formation and properties of hard glass are explained, with emphasis on the importance of careful cooling to obtain the lowest possible coeff. of expansion. On cooling the rate of decrease of strain is proportional to the square of the strain. This relation is derived mathematically. From measurements of many types of glass the coeffs. of expansion for the following substances were calcd.: SiO_2 0.8, B_2O_3 0.1, PbO 3.0, MgO 0.1, Na_2O 10.0, K_2O 8.5, CaO 5. C. C. D. (*C. A.*)

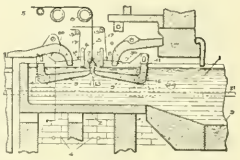
PATENTS

51. Thermo-resistant glass. C. J. VAN NIEUWENBURG. (Holland.) Brit. 200,020, 1922. In the manuf. of thermo-resistant glass, lithium-alumino-silicate, preferably as lepidolite, is added to the ordinary materials, with the addition of a subs. such as zinc oxide or boric acid compd. which promotes the melting process. The glass produced has an increased tensile strength with a resultant increased coeff. of thermal endurance. (*Chem. Trade Jour. & Chem. Eng.*) O. P. R. O.

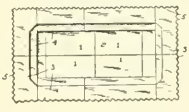
52. Drawing glass sheets. HALBERT K. HITCHCOCK. U. S. 1,463,582, July 31. The process of drawing a glass sheet which consists in chilling a body of glass between the laterally extending walls of a pair of slot members, lying one above the other, in a melted bath of glass, anchoring the base of the glass sheet to said chilled body of glass, and drawing the sheet through the slot of the upper slot member, such upper slot member being of metal and acting as a die, and the lower slot member being of clay.



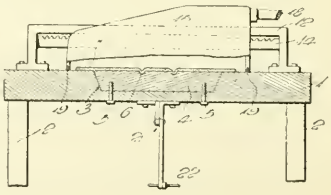
53. Drawing continuous sheet glass. LEONARD D. SOUBIER. U. S. 1,463,273, July 31. In a sheet glass drawing apparatus, a tank containing molten glass, means for drawing a sheet of glass therefrom, a container within the molten glass for segregating that portion of the glass from which the sheet is drawn, the container being divided, substantially in the plane of the glass sheet, into two similar sections, and means for bodily moving the sections toward and from one another to vary the width of the passage therebetween.



54. Glass-handling apparatus. FRANK O'NEILL. U. S. 1,462,652, July 24. A glassware manufacturing apparatus comprising traveling sectional molds, driving means to bring a pair of molds into opposing relation open toward each other, and means carried with one of the molds providing a guide toward the other mold, one of said open molds having a pair of ware engaging shiftable members mounted on the guide, means for engaging an article in one mold, shifting said article out of said mold by travel of the members along the guide means and member coacting means releasing the article into the other mold by opening of the members. Glassware apparatus comprising a traveling carrier, a mold, a rotatable mounting for the mold as to the carrier including a gear, a stationary rack in the line of travel of the gear for rotating the gear, driving means for the carrier providing a station of rest for the mounting, a device movable relatively to the stationary rack and including a toothed section operable to disengage the gear at said station of rest and slow up carrier travel of the mounting as leaving the rack and reaching said device.



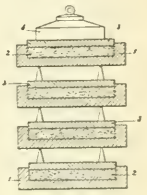
55. Glass-melting tank. HARRY G. WILLETTS. U. S. 1,462,993, July 24. A glass-melting tank having its lateral walls containing refractory bricks, some having one face provided with ribs, the latter being on the outer surface of said tank.



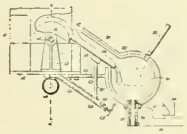
56. Method and machine for constructing embossed glass plate. HARRY F. ANDERSON. U. S. 1,465,507, Aug. 21. The herein described method of forming an embossed sheet of glass consisting in placing a pallet upon a die, forming soft

glass into a thin sheet upon said pallet, drawing said pallet from beneath the sheet of hot glass to allow the sheet of glass to settle upon the die while still hot and in a workable condition, immediately placing a hood over the sheet of glass, and forcing fluid under pressure into said hood to cause the sheet to conform in shape to the die.

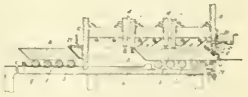
57. Manufacture of articles of glass and the like. MARCEL ARMAND DEMONGEOT. U. S. 1,465,545, Aug. 21. The process of producing a finished molded article from granular or powdered vitrifiable material in a manner to prevent sticking to the mold which consists in placing the material in the mold, raising it while in the mold to a temperature sufficient to soften it but lower than that which would cause sticking to the mold and, while it is being so heated in the mold, subjecting the material to an external pressure acting progressively during the heating operation so as to consolidate the mass in spite of its relatively low temperature.



58. Gathering and delivering apparatus for molten glass. ALLEN CHARLES WILCOX. U. S. 1,465,886, Aug. 21. In apparatus for gathering and delivering molten glass, a main tank, an auxiliary tank, a rotatable gathering disk having a portion extending into said main tank below the normal level of the molten glass, means for rotating the disk, an inclined trough having its lower end positioned to deliver to the auxiliary tank and its upper end positioned to effect removal of the glass gathered on the disk into the trough for conveyance to the auxiliary tank, means for heating the interior of the auxiliary tank, an extension on the auxiliary tank above and parallel to the trough whereby the hot gas from the auxiliary tank will pass over and heat the glass being conveyed by the trough, and means for delivering glass from the auxiliary tank to a glass working apparatus.

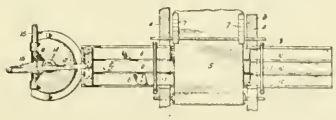


59. Process of and apparatus for forming glass. ROBERT M. CORL. U. S. 1,465,347, Aug. 21. The process of manufacturing sheet glass comprising applying a melting heat to a localized portion of a set mass of glass to flow therefrom a sheet of lesser thickness than the mass, advancing the mass to compensate for the flow of glass therefrom and to maintain a substantially fixed relation between the source of heat and the surface of the mass to which the heat is applied, and successively removing predetermined quantities of glass from a supply of molten glass, permitting them to chill to set condition and successively attaching them to the rear end of the glass mass from which the sheet is flowing and thereby maintaining the continuity of the mass and the flow of the sheet therefrom.



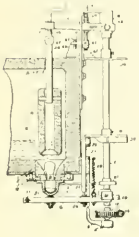
60. Manufacture of heat-insulating articles. JAMES H. DELANY. U. S. 1,464,698, Aug. 14. The improvement in the manufacture of articles having heat-insulating properties due to a vacuum hermetically sealed in glass, which comprises the production, within their interior sealed spaces, of such vacuum as the sole result of the condensation of a gas or vapor confined therein.

61. Sheet-glass-drawing mechanism. THOMAS S. OWENS. U. S. 1,462,495, July 24. In a sheet-glass-drawing mechanism, a chamber through which glass is drawn in sheet form, a table disposed at one side of a soft portion of the sheet and extending transversely thereof and through and beyond each side wall of the chamber, a sheet flattening member guided by the table for movements transversely of the sheet in flattening contact with a surface thereof and being of a length for one end portion to extend without a side of the chamber when another end portion thereof is disposed in rubbing contact with the surface of a

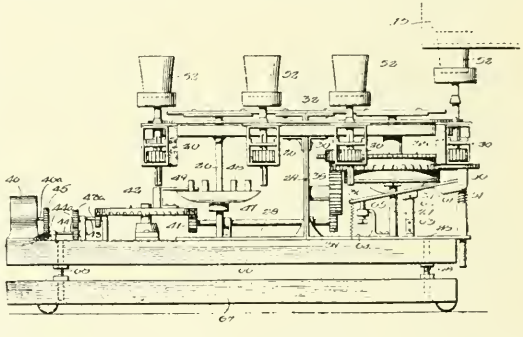


sheet, means without the chamber for imparting reciprocatory movements to the member, and means for cooling each end portion of the flattening member when disposed without a respective side of the chamber.

62. Process and apparatus for feeding glass. WILLIAM J. MILLER. U. S. 1,462,491, July 24. In the feeding of glass, for use in connection with a container for molten glass provided with a discharge orifice, the combination of means intermittently operative for detaching the glass protruding from said orifice to form gathers, a receptacle adapted to contain a quantity of liquid, means for applying said receptacle to the outer end of said orifice between detaching operations whereupon the liquid is gasified by the heat, causing the glass to be temporarily retracted along said orifice for the purposes described, and means for replenishing the supply of liquid to said receptacle when the latter is in its inoperative position, said replenishing means being adjustable to regulate the quantity of liquid supplied to said receptacle. See *Ceram. Abs.*, **2** [8], 177(1923).



63. Glass finishing and polishing machine. GROVER CLEVELAND SCOTT. U. S. 1,462,522, July 24. A machine of the character described including a table, a carrier movable around and upon the table, upright shafts, one of which is rotatable, carrier actuating members on the shafts, a gear wheel loose on the other shaft, means for intermittently rotating the first shaft and thus moving the carrier, means for constantly rotating said gear, a vertically shiftable member adjacent to the gear, a cam rotating with the gear for actuating said shiftable member, a plurality of glass holders each having a stem movable with the carrier above said shifting member, and a gear splined on the stem and engageable with the first named gear, and a frame on the carrier for each holder, in which the holder stem is journaled to rotate and shift vertically, and in which the gear of said stem is freely rotatable and confined against vertical shifting movement with the stem, and a vertically adjustable support for said mechanism consisting of a platform on which the mechanism is mounted, and a base with which the platform is adjustably associated.



64. Glass. SOC. ANON. QUARTZ ET SILICE. Brit. 190,476, Dec. 8, 1922. Fused SiO_2, transparent and free from bubbles, is made by agglomerating the raw material, reduced to fine powder, with gelatinous SiO_2 and then compressing it into molds of the desired shape at a pressure of about 200 kg. per sq. cm. The molded mass is next heated to about 150°, to get rid of moisture, and is then fused in an elec. furnace. Agglomeration of the raw material is facilitated by first transforming it into crystobalite by heating to about 1500°. (*C. A.*)

65. Glass. SOC. ANON. QUARTZ ET SILICE. Brit. 190,477, Dec. 8, 1922. To obtain fused quartz free from bubbles, compact siliceous rocks of a high degree of purity and preferably contg. no micro-cryst. cement are melted. The rock is cut into cylinders which are perforated axially so that they can be threaded on the C electrode of the furnace. (*C. A.*)

66. Glass. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 189,926, Oct. 6, 1921.

Shaped articles, rod, or tube of transparent SiO_2 are made by fusing the SiO_2 under atm. pressure, cooling, reheating the SiO_2 to a plastic state, and then molding to a desired form, or extruding through a die, by applying pressure. The SiO_2 is first freed from bubbles by melting it *in vacuo* and subjecting it to pressure in the manner described in 188,451. A suitable construction is specified. (*C. A.*)

Heavy Clay Products

67. Bricks from oil shale. ANON. *Indus. Aust. & Min. Standard*, **70**, 132(1923).—Experiments are being made in Ger. to produce bricks from oil shale cheaper than clay bricks. One process mixed shale with cement or lime and subjected it to hydraulic pressure, but was not entirely satisfactory. Another process which has been tried successfully at the Prussian Geol. Survey and at several brickworks is as follows: the shales, after the pyrites has been sepd. from them by sifting, are ground up with a propn. of clay or sand which varies according to the richness of the shales, and the powdered mixt. is then molded into bricks, which are put straight into the kiln without being dried. No fuel is required to burn them, as the inherent content of oil in the shales suffices for that purpose. Bricks made in this way are said to be slightly lighter in color than ordinary bricks, but to be no different in appearance otherwise. O. P. R. O.

68. Silica (Sweden). ANON. *Brit. Clayworker*, **32**, 137(1923).—Deep and extensive deposits of silica have recently been discovered in the province of Scania, Sweden; the presence of some 20% of bituminous matter in this silica gives greater value to the discovery, as with such raw material no intermediary processes are necessary, the material as it is brought up being simply pressed into wall, floor and roof tiles of a very high standard of quality. Silica of this kind is to be found nowhere else in the world, the discovery is consequently unique as well as extremely valuable. The total yield is estd. at 800,000 cu. m., the whole being easily accessible at a depth of 5 m.; sufficient to keep all the Scand. countries in building tiles for generations, and leave a margin for export. A new method for the production of tiles in large quantities by special machinery has now been patented, whereby the tiles are at the same time impregnated against damp. These patents, together with the silica deposits, have been taken over by a Swedish building material concern; arrangements have been made to produce 100,000 sq. m. dampproof tiles per yr. O. P. R. O.

69. Firing of building brick in Hoffmann kilns. M. FERNAND WATTEBLED. *Brit. Clayworker*, **32**, 71(1923).—A résumé of a valuable tech. monograph by Wattebled of Paris. The rept. is issued by Société d'Encouragement pour l'Industrie Nationale. According to the raw materials used, the temps. at which the requisite chem. actions are correctly completed may vary from 700 to 1400°C, but max. results are obtained by firing at the highest allowable temp. which will not destroy the color or shape of the goods. The first condition is to ascertain the temp. of gases of combustion and maintain it. This is done by direct measurement and by calcn. The former method requires expensive instruments. By calcn., however, it is possible to det. the temp. of gases at the exact moment of their formation before any loss by cooling occurs. W. describes how he perfected an instrument for taking samples of the gases of combustion simultaneously from a large number of points in a Hoffmann kiln in full fire and was enabled to obtain definite confirmation of a series of calcns. worked out to show the actual reln. between temp. and carbonic acid content. A fuel of known calorific value was used throughout the expts. He illustrates his points by diagrams and tables. They show that to obtain the max. useful effect from the combustion of fuel in a kiln, it is essential that the production of carbonic acid should be constant and correspond with the amt. showing the production of the firing temp. of the goods. There are 4 distinct zones in the process of firing: (1) that which comprises chambers of goods in process of

cooling; (2) that in which combustion of the fuel takes place; (3) that in front where green goods are being heated; (4) that in which goods are being set and drawn. Intermittent firing causes a considerable loss of time and heat and is obviously not the most satisfactory. The phenomena which occur in the firing zone are discussed at length by means of tables and diagrams, the calcns. being based on 9 rows of feed holes. The ideal temp. curve is shown in the diagram and the conclusion is that in order to attain it in the burning of a Hoffmann kiln mech. continuous feeding is essential. A mech. feeding device must satisfy the following conditions: (1) Possibility of varying the speed of the whole installation. (2) Coördination of the working of all the units of fuel distribution. (3) Possibility of varying the rate of feed of each individual unit according to its position on the kiln, while the general movement is coördinated. (4) A type of machine that can deliver to the feed-holes very small but strictly regular quantities of fuel. Instantaneous combustion of the fuel is essential and is insured by fine pulverization, and by the fact that the fuel falls unimpeded through a certain height in the interior of the kiln. The heat value of the flame of a number of different types of fuel is as follows: (Amounts in degrees C.) Oak wood, 1865; peat (dry), 2020; lignite, 1960; long flame coal, 1960; anthracite, 2030; coke dust, 2018; locomotive ashes, 2029; colliery duff, 68% ash, 1635. Inferior fuels can be successfully used if finely pulverized, the author has proved by firing more than 100 T. of bricks at 1000°C every 48 hrs., in a kiln burning only locomotive ashes. The exhaustive researches of W., have laid the foundation of a vaulable tech. advance in the large scale practice of brick firing. O. P. R. O.

70. Specifications for building and sandlime brick in Austria. ANON. *Tonind.-Ztg.*, **47**, 492–3(1923).—*Building brick.* (1) *Definition.* All fired brick made of clay, loam, or clay-like material together with sand, broken quartz rock, dry clay powder, or fired clay are classed as building brick. (2) *Kinds.* Brick are divided into the following classes depending upon their compress. strength: (*a*) clinker (*b*) hardfired brick (*c*) common brick. (3) *Compress. strength.* The av. compress. strength made upon at least 10 specimens should be at least above the foll. values: (*a*) clinker = 600 kg./qcm. (*b*) hardfired brick = 300 kg./qcm. (*c*) common brick = 120 kg./qcm. Brick which do not meet these specif. should be called "underfired." (4) *Shape.* Building brick should have a true shape and should correspond to the following dimensions: Large size brick—29 cm. long, 14 cm. wide, and 6.5 cm. high. Small size brick—25 cm. long, 12 cm. wide, and 6.5 cm. high. (5) *Absorption.* The absorption will be tested as follows: At least 5 bricks should be dried until they no longer lose wt. after which they are weighed. They are then immersed in water and allowed to remain there until they no longer absorb water. The increase in wt. above the dried brick should be less than the following: (*a*) clinker = 2% (*b*) hardfired brick = 8%. The absorption for common brick is not limited but is usually above 8%. (6) *Resist. to freezing.* Clinker, hardfired brick, and brick used as front brick and for facing must be resistant to the freezing test. The freezing test is conducted in the foll. manner: About 10 brick are immersed in water in a hole at least $^1/_2$ cbm. or in a tank of corresponding size, 25 times, being frozen to a temp. of at least 4°C each time for at least 4 hrs. and then allowed to heat up to room temp. *Sand lime brick.* (1) *Definition.* All brick made from a mortar-like mixt. of a high quartz and low feldspar sand and lime which has been pressed and treated with steam at a pressure of 8 atms. are known as sand lime brick. (2) *Kinds and compress. strength.* Hard sand lime brick must have an av. compress. strength of at least 120 kg./qcm., this being the av. of at least 10 specimens. Sand lime brick not meeting these specif. are known as medium hard. (3) *Shape.* The shape corresponds to that of clay brick. They should be true and correspond to the following dimensions: Large size brick: 29 cm. long, 14 cm. wide, and 6.5 cm.

high. Small size brick: 25 cm. long, 12 cm. wide, and 6.5 cm. high. (4) *Absorption.* The absorption of water is not limited but as a rule should be between 11 and 17%. (5) *Other requirements.* (*a*) Upon being struck they should have a clear ring. (*b*) The fracture should have a uniform structure and should be free from lime grains and holes; the presence of large pieces of silica are admissible. H. G. S.

71. Manufacture of hand molded sand-faced brick and tile. ANON. *Brit. Clayworker*, **32**, 112–3(1923).—Different methods of setting brick and tile in kilns are described. H. G. S.

72. Modern tile making. ANON. *Brit. Clayworker*, **32**, 100–2(1923).—The raw materials used for making tile are described. Sawdust is used in the manuf. of filter tile and for others which are required to be extremely porous. It is a mistake to use soft wood sawdust for this purpose as the particles are too coarse, sawdust from hard-wood is in every way preferable, as well as producing much finer pores. H. G. S.

73. Microscopic structure of common brick. SEIJI KONDO. *J. Jap. Cer. Assoc.*, **370**, 283–91(1923).—Structure of common brick manufd. at the 2 biggest plants in Tokio and Osaka districts is reptd. Their chief raw materials are loams in Tokio and stoneware-clays in Osaka, small propns. of sand being used at both plants. Their mineral compns. are given. The brick are made with spiral presses and burned in ring kilns. They are classified into 8 grades in Tokio and 6 in Osaka. Quality of the brick is as follows:

	Tokio		Osaka	
	Grade 1	Grade 8	Grade 1	Grade 6
Absorption in 48 hrs.	9.94%	18.17%	6.66%	14.60%
Porosity	27.04%	36.87%	22.93%	32.29%
Crushing strength (kg. per sq. cm.)	554	139	595	162

1. *Structure of the Tokio brick.* Thin sections of brick, which were fired at cone 09a–05a in a ring kiln in Tokio, show plagioclase, quartz, impure dehydrated clay, hypersthene, orthoclase and very small amts. of microcline, hornblende and fragments of groundmass. Hypersthene has slight sign of fusion even in the grade 8. Plagioclase in the grades 1–5 and orthoclase in grade 1 show similar signs. The grades 1–5 have slight amts. of glass. 2. *Structure of the Osaka brick.* Thin sections of brick, which were fired at cone 05a–03a in a ring kiln in Osaka, contain quartz, impure dehydrated clay, orthoclase, radiolaria quartzite, plagioclase and slight amts. of microcline, hypersthene, hornblende and biotite. Plagioclase in all grades, hornblende in the grades 1–5 and quartz, orthoclase as well as microcline in the grades 1–4 are melted in varying degrees. Even the grade 6 contains a small quantity of glass. The grades 1–4 have considerable amts. of sillimanite. 3. *Min. compn.* Approx. min. compns. of the brick have been calcd. from their analyses under assumptions that the brick have only 7 constituents as described below and also that hypersthene has a definite compn. as $3MgO.2FeO.5SiO_2$.

Brick	Orthoclase and microcline	Albite	Anorthite	Hyperthene	Dehydrated clay	Quartz	Ferric oxide
Tokio	10.5	15.0	15.8	13.0	17.0	23.6	5.1
Osaka	13.0	6.6	2.4	3.6	18.7	52.1	3.6

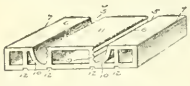
4. *Formation of glass.* Of the Tokio brick, the grades 1–3 contain small amts. of colorless and light brown glasses, while the grades 4 and 5 have only light brown glass. Of the Osaka brick, the grades 1–3 have considerable amts. of light brown glass with many cracks and bubbles and also cracked colorless glass which appears to be filling most of voids in the thin sections, diam. of these glasses being often as large as 1.1–

1.5 mm.; the grade 6 has only a small amt. of light brown glass. The facts that quartz, feldspars and the other minerals were melted at such low temps. and also that considerable amts. of glass were formed may probably owe to the presence of minute particles of various minerals and their products of decompn., which would compose very fusible mixts. non-uniformly distributed all through the body. These eutectic mixts. will melt at first in the firing and the glass will act on grains of quartz and the other minerals to dissolve them. Large colorless glasses in thin sections of the Osaka brick have often regular outlines or small nuclei of quartz or feldspars. 5. *Formation of sillimanite.* The grades 1–4 of the Osaka brick have considerable amounts of sillimanite. Many crystals in the grade 1–4 are as long as 0.05–0.02 mm. Twelve micro-photographs are given. S. K.

74. The heat-insulating power of structural material. H. BURCHARTZ. *Tonind.-Ztg.*, **46**, 713–4, 721–2; *Chem. Zentr.*, **1922**, IV, 701.—Expts. were made on sand-lime brick with the heat-insulation tester of Gary-Dittmer. Its high heat-insulation capacity is due to its porosity and quartz content. Sand-lime brick can be ranked with other brick in regard to this property. C. C. D. (*C. A.*)

PATENT

75. Channel brick. ARTHUR HARDONCOURT. U. S. 1,463,697, July 31. A channel brick having two substantially parallel channels which are relatively deep and leave only webs between the bottom of the channels and the bottom of the channel-brick, corrugations on the channel brick at the inner sides of the channels, the channel brick at the outer sides of the channel being curved downwardly and inwardly to the inner sides of the channels so that the channel brick at the channels will be strong and the channels at their upper portions will be relatively narrow while sufficient to permit a mason to introduce his fingers while partially closed into one of the channels without striking his knuckles against the outer walls of the channels, the channel brick having load-bearing portions between and at the outer sides of the channels.



Refractories

76. The Derbyshire Silica Firebrick Co. works at Frieden. ANON. *Brit. Clayworker*, **32**, 113–4(1923). H. G. S.

77. Setting a Lancashire boiler. ANON. *Brit. Clayworker*, **32**, 119(1923).—Special blocks for setting boilers are described. H. G. S.

78. On refractory cement. TEI TAKAMATSU AND MASATAKE KUWAYAMA. *J. Jap. Cer. Assoc.*, **368**, 167–75(1923).—The authors have worked for the production of substitutes for "hytempite" which is imported from America. Hytempite has alk. reaction, its strength corresponding to 0.0276 g. NaOH per g. of sample. Analysis of dried sample is: Total silica 68.66, sol. silica 4.33, alumina 16.26, ferric oxide 2.60, lime 1.25, magnesia 0.92, soda 3.73, and loss on ignition 6.53%. It melts at about cone 15, while its insol. portion has a refractoriness of cone 27. The effect of adding different amts. of water glass to the insol. portion of hytempite, 7 kinds of domestic clays and a diatomaceous earth on their refractoriness are shown; the results indicate a close similarity between Mizuno clay and the insol. portion of hytempite. The expts. of mfg. refractory cement with Mizuno clay, grog and water glass are reptd. Analyses of these materials are:

	SiO_2	Al_2O_3	Fe_2O_3	CaO	Mg	Na	Ignition loss
Mizuno clay	69.12	16.68	0.55	1.80	0.99	...	8.20
Grog	73.20	21.84	.90	1.24	.83	...	...
Water glass	36.56	...	....	....	....	18.81	44.63

Two small slabs cut from fire brick were cemented with each mixt. The blocks were then heated at 1350°C (for 8 hrs.), 1580° (100 hrs.), 1510° (104 hrs.), 1470° (110 hrs.), 1490° (113 hrs.) and 1345° (10 hrs.). Then they were tested as cements for cracked glass pots. The foll. mixts. together with several others are at least as good as hytempite:

No.	Mizuno clay	Water glass	Grog	Water
20	30	15	55	9
42	30	25	45	5
43	25	25	50	5

S. K.

79. Jointing materials for refractories. D. Jones and W. Emery. *Foundry Trades Jour.*, **28,** July 12(1923).—The authors devised expts. to test the effect of mixt. in various propns. of fire clay, ganister and crushed silica brick (grog), and in some cases the effect of adding certain compds., *e. g.*, plaster, lime, and sodium silicate to the mixts. The mat. were first thoroughly mixed in the dry state, and water was then added to the proper consistency. A layer about 3 in. thick was spread between two 2-in. cubes prepd. from hand-make silica brick. When air-dried, the samples were fired to cone 16 in an elec. fur. under load of 50 lbs. per sq. in. The temp. was raised for 3 hrs. to cone 16 and then maintained constant for 1 hr. In order to provide a more drastic test, some mixts. were heated to cone 20 under the same load. Briquettes were also made from the mixts. and tested for contraction or expansion, crushing strength and resist. to slag-penetration. It was found that mixts. of fire clay and ganister have much greater expansion than those of clay and grog, but on the average these mixts. have a greater crushing strength and much higher resist. to slag-penetration. Although jointings of clay-ganister mixt. lack adhesive power, they are very hard and firm compared with clay-grog mixts., which are deficient in mech. strength and are crushed out when fired under load. Clay-grog mixts. especially such as have the latter component in excess, are badly attacked by slag. These briquettes have open texture with large pores into which the slag freely penetrates. Clay-ganister mixts. sinter more readily than clay-grog mixts., and a clay-ganister mixt. of 1:1 softens so much that, heated to cone 16 under load, the cement is squeezed out. It was found that an admixt. of fire clay, ganister and grog gave the best results. In 2 mixts. a fat, plastic ball clay was added in slip form instead of ordinary fire clay, and one was found to be exceptionally good in all respects. Compared with a mixt. using fire clay, with ganister and grog in the same propns., the mech. strength was more than doubled and resistance to slag-penetration greatly increased. The jointing was very hard and firm, and even when fired to cone 20, the cement was still good. (*Bull. Cleveland Tech. Inst.*, **1923,** July.) O. P. R. O.

80. Refractory silica materials of S. Wales, with special reference to the influence of texture. W. R. R. Jones. *Trans. Ceram. Soc.* (England), **21,** 358–93(1921–2).—Microscopical examn. indicated that quartzites suitable for use in the manuf. of silica bricks should consist of angular grains set in a siliceous cement in optical continuity with the quartz grains, and should contain some chert or crypto-cryst. silica, but little non-siliceous matter. They should show a wave-like extinction of the quartz grains. The crushed silica rocks and sands were graded by sieving and by the elutriation of the material passing through a 30-mesh sieve. The results obtained gave further evidence of the similarity of the materials used in S. Wales for the manuf. of silica brick. Test-pieces molded with water from the raw materials and without the addn. of any bonding material were heated to 1350° and their cold crushing strengths subsequently detd. It was seen that the finer the grade of the material the higher was the compressive strength of the test-pieces. The drying shrinkage was small, while a further shrinkage of about 0.2% was found after firing to 1000°, but the brick began

to show expansions after burning at 100°. The sp. gr. of the brick decreased with successive firings, the rate of conversion of the quartz increasing with the fineness of the material. J. S. C. I.

81. Requirements of a refractory mortar. R. F. Lindsay. *Chem. Met. Eng.*, **28**, 1080(1923).—A refractory mortar must have a m. p. close to that of the brick with which it is used. The expansion and contraction of the mortar and also its chem. properties should be similar to those of the brick. W. H. B. (*C. A.*)

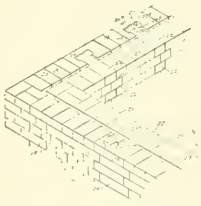
82. The melting point of coal ash. F. S. Sinnatt, A. B. Owles and N. Simpkin. *Colliery Guardian*, **125**, 1131(1923).—A new method for detg. the m. p. of coal ash, used successfully for 4 yrs., is described. A small compact furnace of MgO brick is bored through the center to take a SiO_2 tube. A vertical hole at right angles serves for heating the SiO_2 tube with an oxy-coal gas burner beneath the brick. Detns. are made with 0.2 g. of ash, prepd. in thread shape. Ash from coal from different horizons in the same seam varied considerably in m. p., showing the need of careful sampling. Certain bands in a seam had a very high m. p. (over 1440°) compared with the bulk of the seam. No relation was found between m. p. and chem. compn.
C. C. D. (*C. A.*)

83. Properties and testing of refractories. R. Rieke. *Gas u. Wasserfach*, **66**, 33–6, 53–5, 66–8(1923). J. L. W. (*C. A.*)

PATENTS

84. Crucibles, retorts, etc. Ferolite, Ltd. and H. B. Clapp. Brit. 189,692, Feb. 7, 1922. Crucibles, retorts, and other vessels for high temp. work are molded from a mixt. of chromite and ferro-Si with a binding agent such as Na silicate soln. Cf. 183,219. (*C. A.*)

85. Treating alunite. E. Moldenke. U. S. 1,457,787, June 5. Finely divided alunite is treated with more than sufficient H_2SO_4 to convert the Al into sulfate, forming a paste, the mixt is heated until it forms a brittle cake and after the material is disintegrated it is introduced into a closed chamber and heated to cause evolution of fumes from the free acid present and render the values sol. in H_2O. The heating and hardening of the pasty mixt. may be carried out on a sheet-metal flexible conveyor the flexing of which serves to break the caked material and dislodge it from the conveyor. Clay and bauxite when treated with H_2SO_4 may be similarly handled. (*C. A.*)



86. Furnace wall. Michael Liptak. U. S. 1,463,044, July 24. A wall structure made up of a main masonry outer wall and a replaceable inner facing wall, one of said walls including blocks having lock head seats with entrance throats leading thereto, and the other wall including blocks having necks formed with lock heads, said heads being insertable into and removable from interlocking engagement with said seats by movement in the wall in the space between immediately adjacent lower and upper layers of blocks or brick. (Cf. *Ceram. Abs.*, **2** [9], 196(1923).)

87. Furnace wall. Michael Liptak. U. S. 1,463,050, July 24. A composite furnace wall comprising a permanent masonry outer wall having therein horizontal rows of sill-forming blocks, overlying horizontal rows of lintels and intervening pilasters, forming vertically spaced rows of horizontally spaced pockets, in combination with a high refractory replaceable masonry inner wall including shelf-forming blocks projected into and anchored within the pockets of said permanent wall.

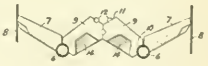
88. Partition wall for furnaces. Michael Liptak. U. S. 1,463,051, July 24. A composite partition wall for furnaces comprising a permanent center wall and shelf-forming elements anchored to and projecting from opposite sides of said wall and replaceable facing walls anchored to said center wall by said shelf-forming elements.

89. Furnace wall. MICHAEL LIPTAK. U. S. 1,463,052, July 24. A composite furnace wall comprising a permanent masonry outer wall having therein horizontal rows of sill-forming blocks, overlying horizontal rows of lintels and intervening pilasters, forming vertically spaced rows of horizontally spaced pockets, in combination with a high refractory replaceable masonry inner wall including shelf-forming blocks projected into and anchored within the pockets of said permanent wall, said shelf-forming blocks each being substantially the width of a coöperating pocket.

90. Furnace wall. MICHAEL LIPTAK. U. S. 1,463,053, July 24. A composite furnace wall comprising a permanent masonry outer wall having horizontally spaced pilasters and intervening pockets, in combination with a high refractory inner wall including shelf-forming blocks that project into the pockets of said permanent outer wall, said shelf-forming blocks comprising outside and intermediate sections, the former having interlocking engagement with said pilasters and being held interlocked therewith by the intermediate lock sections.

91. Furnace wall. MICHAEL LIPTAK. U. S. 1,463,058, July 24. A wall structure made up of a masonry outer wall and a replaceable inner wall, said outer wall including tile anchor boxes and said inner wall including shelf-forming blocks extended into and anchored within said anchor boxes, said anchor boxes being rectangular, the bottom portions thereof affording sills and the top portions thereof affording lintels and the end portions thereof affording pilasters in the outer wall, said anchor boxes being horizontally divided and set with their pocket-forming portions aligned but with their pilaster-forming end portions offset so as to form staggered joints between the upper and lower box-forming sections.

92. Fire-brick arch. ALFRED H. WILLETT. U. S. 1,463,184, July 31. A tube supported fire brick arch construction comprising a series of pairs of invertible brick supported between two tubes, said brick in each pair being inclined toward and resting against each other and each brick having at the meeting end two oppositely inclined supporting surfaces constructed to permit the brick to be rested against each other either face upward. See *Ceram. Abs.*, **1** [5], 142(1922); *ibid.*, **1** [7], 185(1922).



93. Arch brick. GUY CARLETON DENNEY. U. S. 1,463,156, July 31. An arch brick member having along one edge an arch brick support engaging surface and having on its opposite edge a cut back portion having an inclined end surface and a projecting portion having an oppositely inclined end surface, the planes of said surfaces not intersecting within the body of the member and said portions being complementary whereby when a pair of such members are assembled in reversed relation they coöperate to form a brick, said inclined end surfaces being serrated or roughened.

Terra Cotta

94. Roofing tile industry in Ishikawa prefecture. KYOTARO KOYAMA, TOMOZO ISHIDA AND YOSHITAKA NAKAMURA. *J. Jap. Cer. Assoc.*, 369, 243–54(1923).—Only glazed roofing tiles are produced in the prefecture. The body is composed of 1 or 2 kinds of local clays with or without addn. of sandy clay or sand. Eight kinds of clay, each used as sole body mat., have compn.: silica 59.49–67.77, alumina 13.46–20.21, ferric oxide 3.53–7.52, lime 0.51–4.41, magnesia 0.06–2.21, alkalies 0.03–0.82 and loss on ignition 7.60–16.16%. Body is prepd. by kneading its mat. with or without aid of pug mill and clay cutter. No machine is used in the forming. The tiles are glazed after biscuit-firing. Glazes are composed of local rock, ferric oxide and pyrolusite, sometimes with addn. of galena. Now they are fired in semi-continuous kilns called

"Noborigama" at cone 6a–9. All samples taken from 17 manufacturers have perfectly stood the usual test for freezing. Their absorption in 48 hrs. ranged from 3.4 to 17.7%.
S. K.

Whiteware

95. Improvement of the firing procedure for whiteware kilns. E. Reutlinger. *Ber. der Deut. Keram. Gesell.*, **4** [1], 1–35(1923).—The results of several firings in a small coal fired kiln of 6 cu. m. vol. and in several industrial kilns of 45–170 cu. m. vol., are given in graphs and tables. The object of the expts. was to find the best firing procedure using as little coal as possible. All temp. were measured both with thermocouples and cones. The gases were analyzed both with the Orsat and recording instruments, and a continuous draft record was taken. The ideal curve for the biscuit burn in the small kiln is (1) raise temp. to 100°C the first hr. (2) raise rapidly at 350°C rise per hr. for 2 hrs. to 800°C (3) raise slowly for 7–8 hrs. at 40–60°C rise per hr. to 1150°C. The ideal curve for the glost burn is (1) raise temp. 230°C per hr. for 3 hrs. to 700°C (2) raise at 120°C per hr. for 3 hrs. to 1050°C (3) hold at end temp. for: $^1/_2$–1 hr. The curves for the industrial kilns naturally show a longer burning time. In these kilns a good biscuit burn on small ware will use from 0.25–0.40 lb. of coal per lb. of ware + sagger burned, and for the glost burn, 0.20–0.25 lb. of coal per lb. of ware + sagger. In firing large sanitary ware, 2–3 times this amt. of coal will be used. The larger the vol. of the kiln, the less coal per unit of vol. is used. The importance of kiln design in order to diminish temp. differences and shorten burning time is emphasized, and expts. are now under way along this line. By connecting together several kilns having a single chimney and using the heat from a cooling kiln to warm up a cold kiln, a saving of 15–20% in the amt. of coal used is possible. See *Ceram. Abs.*, **1** [8], 214(1923). E. N. B.

96. Chemical porcelain. G. N. White. *Trans. Ceram. Soc.* (England), **21**, [4], 320–7(1921–2).—The resistance to fracture, in consequence of abrupt changes in temp., of heterogeneous supercooled fluids, of which hard porcelain is a type, is in general raised by conversion as far as possible into the cryst. state. This requires the bulk of the Al_2O_3 in porcelain to have crystd. out as sillimanite. The formation of sillimanite is the more complete the lower the proportion of bases present, although a certain proportion of bases is essential to the formation of sillimanite. The practical problem is therefore to det. the minimum propn. of bases which gives under practicable time-temp. treatment a totally impermeable body. The relative resist. to fracture of porcelain was detd. by heating test-pieces in a bath of molten $NaHSO_4$ at a definite temp. and then transferring rapidly to a bath of eosin soln. J. S. C. I.

97. The production of porcelain for electrical insulation. III. F. H. Riddle. *J. Am. Inst. Elec. Eng.*, **42**, 631–5(1923); cf. *Ceram. Abs.*, **2** [9], 199(1923).—China and ball clays are tested for fired color, porosity, fineness of grain, and strength. Particular emphasis is placed upon the grain size of quartz, for which water sepn. is recommended. Limits of compn. are wide but the quality depends on the compn. Special spark-plug porcelains are made by eliminating feldspar and quartz and substituting synthetic calcines. Firing first drives out the H_2O then the feldspar melts and dissolves the clay and quartz or assists these to change into sillimanite and free SiO_2. The soln. of quartz depends upon the grain size and heat treatment Ordinary porcelain has a tensile strength of 3000–6000 lbs. per sq. in. and a coeff. of linear expansion of 4–9 $\times 10^{-6}$ per °, while special porcelain may reach a strength of 12,000 lbs. and a coeff. of 2.7 $\times 10^{-6}$.
W. E. R. (*C. A.*)

98. Experiments on the low-temperature final firing of porcelain. W. Funk. *Sprechsaal*, **55**, 312–3; *Chem. Zentr.*, **1922**, IV, 700–1.—The expts. were carried out at cones 8–9 in the compn. range specified by Hertwig-Möhrenbach. In general the stability of the porcelains was not great. C. C. D. (*C. A.*)

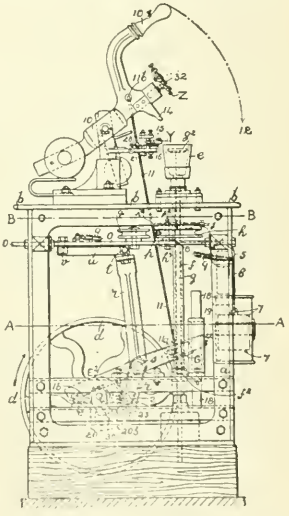
99. Stoneware as material for the construction of apparatus and machines. C. HEINEL. *Chem. App.*, **10**, 85–7, 93–5(1923).—A mathematical consideration, with 7 charts and tables, of some of the properties of stoneware, such as flexibility, compressibility, porosity, heat cond., expansion, resist. to internal and external pressure, etc.
J. H. M. (*C. A.*)

BOOK

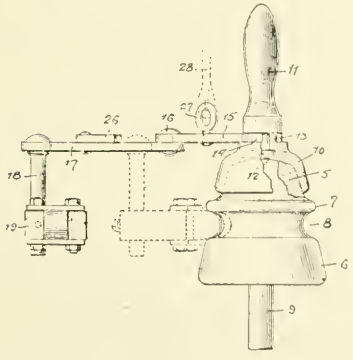
100. The A. B. C. of English Salt-Glaze Stoneware, from Dwight to Doulton. J. F. BLACKER. London: Stanley Paul & Co., 15s. net. Reviewed in *J. Roy. Soc. Arts*, **71**, 565(1923). (*C. A.*)

PATENTS

101. Machine for use in the manufacture of teacups, breakfast cups, beakers, and other vessels or articles of pottery. ELIJAH BROOKES. U. S. 1,465,577, Aug. 21. In a pottery machine, a chuck for holding the article provided with a vertical driving shaft, a lever pivoted to rock in a horizontal plane and provided with a knife for cutting off the upper part of the article when revolving with the chuck, an arm pivoted to work in a vertical plane and provided with a projection which operates the said lever when the arm is lowered, and a rounding tool carried by the said arm and engaging with the rim of the article after its upper part has been cut off by the knife.



102. Apparatus for shaping insulators. LORENZO C. BUCKLEY. U. S. 1,465,157, Aug. 14. A shaping tool for pin type insulators, comprising a cap adapted to fit in the head of a preformed insulator blank, and a lateral shaper pivoted with relation to the cap and adapted to bear against the side of the blank during its rotation.



103. Washtub. M. HAGAMAN. U. S. 1,462,573, July 24. A wash tub having bottom, front, back and end walls, and a hollow imperforate box-like projection extending rearwardly from the inner upper portion of the face of the front wall and provided with an inclined rubbing surface on the rear side thereof, said boxlike projection being of less width than the width of the front wall and of less depth than the depth of the tub, whereby said projection is spaced from the opposite ends of the tub and from the bottom of the tub.

Equipment and Apparatus

104. The A. E. G. optical pyrometer. ANON. *Brit. Clayworker*, **32**, 108(1923).—The A. E. G. instrument is a simplified form of the Holborn-Kurlbaum pyrometer. It registers temps. between 650° and 1500°C to within an accuracy of ±5°. It is based upon the principle of the disappearing filament, and is extremely simple in construction.

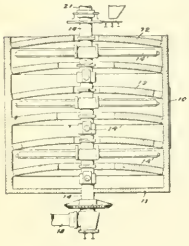
It consists namely of central optical tube, in the forepart of which a carbon filament lamp is fixed. This tube is encased within a second, which carries a double wound, non-inductive resistance coil. A 3rd protective tube, upon which is the temp. scale, covers the resistance tube. In addn. this outer tube is fitted with a slide, which is in contact with the resist. The instrument is provided with a grip, which is held in the left hand, the right being free to manipulate the slide. The pyrometer is graduated in accordance with the voltage of the supply cable; variation in the voltage, therefore, must be allowed for in making exact measurements. The temp. correction for a variation of one volt is given on the slide. For instance, if, in using a 220-volt pyrometer, the correction for which is ± 2 per volt, the voltmeter registers 220 volts, the true temp. will be 4 higher than that indicated on the scale. These instruments are made to operate on both a. c. and d. c. circuits up to 220 volts; for an a. c. circuit of over 220 volts, a transformer is necessary. For voltages up to 190, the pyrometer may be coupled up directly with the supply cable. H. G. S.

105. A proposal for the establishment of a new scale of hardness for glass and crystals. BERNHARD HALLE. *Deut. opt. Wochschr.*, **8**, 98–100; *Chem. Zentr.*, **1922**, IV, 101.—After a short summary of older methods and app., a modification of the method of Rosiwal is described. Instead of a definite amt. of abrasive being used until it becomes useless, it is continuously renewed and that used is sepd. out. It is assumed that the hardness is proportional to the loss in wt. under fixed conditions. The abrasive and the necessary liquid (usually H_2O, but olive oil for diamond and EtOH or C_6H_6 for H_2O-sol. crystals) are enclosed in a 2-section shell and the latter is so rotated that the sample is given a cycloidal motion. The used abrasive is scraped from the lower section of the shell; emery or carborundum is used for soft materials, diamond for hard. C. C. D. (*C. A.*)

106. The new precision pycnometer. B. BERGDAHL. *Chem.-Ztg.*, **47**, 530(1923).—The neck of the app. is cut off obliquely. The stopper has a hole bored from the lower end which passes through the side at a point just above the low side of the oblique neck. The stopper is inserted in the filled app., the excess liquid flows out through the hole in the stopper which is then turned to close the hole. J. H. M. (*C. A.*)

107. New hardness tester. ANON. *Iron Steel Can.*, **6**, 145–8(1923).—A description is given of the Herbert pendulum hardness tester recently invented in England. This instrument gives direct and rapid readings of hardness and can be used for testing the hardness of substances ranging from Pb to sapphire. V. O. H. (*C. A.*)

108. Engineers develop pocket viscometer. ANON. *Nat. Petroleum News*, **15** [30], 92–4(1923).—A pocket viscometer consists of 2 bulbs, one carrying a standard liquid and the other the liquid to be tested. Viscosity in Saybolt sec. is read directly by the rate at which a sphere falls through each liquid. The accuracy of the instrument runs as high as 99% with an experienced operator. D. F. B. (*C. A.*)

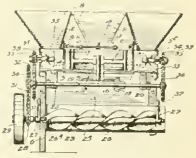


PATENTS

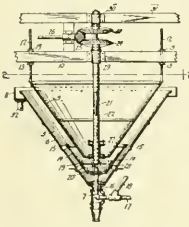
109. Rabble-furnace construction. BENJAMIN G. CALL. U. S. 1,465,417, Aug. 21. In a device of the class described, the combination of a rabble arm provided with a guide supporting member extending lengthwise thereof, a plurality of rabble guides slidably mounted on said member, adjacent sides of contiguous guides being provided with rabble supporting means, and a plurality of rabbles, each supported by said means between the contiguous guides whereby any pair of adjacent guides may be separated to permit the removal of the rabble carried thereby without affecting the mounting of the other rabbles.

110. Percentage feeder and mixer. ANGUS D. MACLELLAN. U. S. 1,462,649,

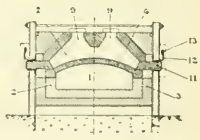
July 24. In a feeder of the class described, the combination with a base plate having recesses in its outer periphery, a wheel journalled to said plate, means between said recesses delivering different material laterally to said plate, and means on said wheel for conducting the material to said recesses.

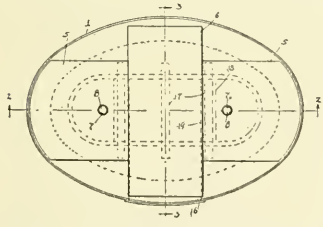


111. Ore concentrator. JOHN I. MULLEN. U. S. 1,465,143, Aug. 21. In an ore concentrator, the combination of an outer cone and an inner cone forming an annular channel for grading ore-particles carried in an aqueous medium into concentrates and tailings, an overflow conduit disposed to receive material passing across the upper edge of the outer cone, an intermediate cone dividing the lower portion of the channel into receiving and discharge compartments, means revolving in opposite directions in said receiving compartments for agitating the pulp, and means for receiving pulp to and discharging pulp from the respective compartments.



112. Electric furnace. MARIUS SAUVAGEON. U. S. 1,464,543, Aug. 14. An electric furnace, comprising a hearth the crown wall of which is formed of material which is a good conductor of heat and at high temperatures a good conductor of electricity, a series of heating chambers above said crown wall, granular resistance material filling said heating chambers, and electrodes extending into said chambers and contacting with said granular material. Cf. *Ceram. Abs.*, **1** [11], 279(1922).





113. Electric furnace. CHARLES A. CADWELL. U. S. 1,464,496, Aug. 14. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being composed of a plurality of carbon rods plastered over with a layer of suitable heat-resistant material.

Kilns, Furnaces, Fuels and Combustion

114. The draft in rotary kilns. A. HEISER. *Tonind.-Ztg.*, **47**, 492(1923).—The damper in most fur. is usually left in one position owing to lack of knowledge of how to use it. H. describes the use of a draft gage to meas. draft in rotary kilns. By means of this gage the static and dynamic press. are recorded. Dynamic press. is the highest press. produced by a gas in motion and is represented by the following formula: $dp = YW^2/2g$ in which W is the velocity of the gas, Y the sp. gr. of the same, and g is the acceleration due to gravity which is 9.81 m. per sec. The total pressure pg is the algebraic sum of the static press. $pg = pst + pd$. If one meas. the total press. and the static press. in the same cross-section, the following holds true:

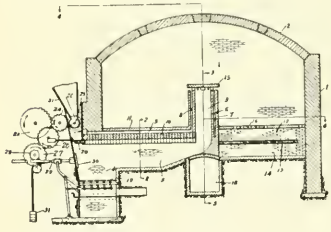
$$\frac{YW^2}{2g} = pg - pst,\ W = \sqrt{\frac{2g(pg - pst)}{Y}}\ \text{m./sec.}$$

An instrument made by the Schultze Co. (Berlin-Neukölln) is described. H. G. S.

115. A novel coal elevator. ANON. *Brit. Clayworker*, **32**, 108(1923).—An elevator for hoisting wheel barrows full of coal from the ground up to the top of a Hoffmann kiln is described. H. G. S.

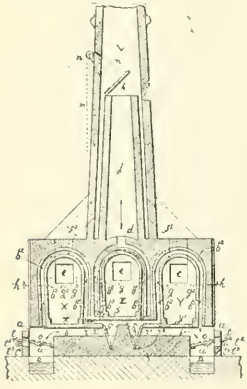
116. Coal distributors. ANON. *Brit. Clayworker*, **32**, 106–7(1923).—Coal distributors for feeding powdered coal into Hoffmann kilns are described. In hand feeding the burner visits and charges each feed hole about once every 20 min. The temps. rise considerably after each feeding causing fluctuations in temp. and overheating near the floor of the kiln. In the hand feeding of Hoffmann kilns it is difficult to get sufficient heat to the crown of the kiln. Most of these troubles can be overcome by using automatic pulverized coal feeders for introducing the coal. In this feeder the powdered coal is fed in minute rapid repeating quantities which raises the temp. of the kiln gradually, does not overburn the bottom, and causes the top to become as thoroughly heated as the rest of the kiln. Damage to brick lining of the feed holes is almost entirely prevented. The economy in fuel resulting from the use of this method was found to be from 20 to 30% over hand feeding. It is also claimed that lower grade fuels can be used in this method of feeding. H. G. S.

117. A car stopping device for tunnel kilns and driers. ANON. *Brit. Clayworker*, **32**, 110(1923).—It is frequently suggested that the opern. of a tunnel kiln or tunnel drier would be facilitated if the rail tracks were inclined downward toward the exit and instead of being laid level. In the latter case which is usual, a mechanical device is necessary to push the long train of cars along the track. This device can only be operated if the tunnel is full of cars and an additional car is ready at hand to be added to those already in place when the whole train is pushed forward. If the track is inclined the cars will travel by gravity to the exit end, the only requirement being a safety stop to prevent over-running when the whole train is in movement. A satisfactory stop for handling cars on an inclined track is described. H. G. S.



PATENTS

118. Kiln. ENOCH P. STEVENS. U. S. 1,465,744, Aug. 21. A kiln comprising a center flue for the admission of heated gases, a horizontal floor, means coöperating with said flue for deflecting gases downwardly toward said floor, apertures in said floor and a baffle wall placed below said floor for causing the heated gases to take a tortuous course in passing from said kiln.

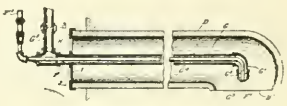


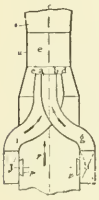
119. Car for tunnel kilns. STEPHEN A. MITCHELL. U. S. 1,465,737, Aug. 21. A car for transporting bricks and analogous ware through a tunnel kiln comprising a body portion and pier-like goods supports thereon extending transversely to the direction of car travel and spaced apart to provide channels open at their outer ends and upper edges, said supports having their upper edges sloping downwardly from the sides of the car toward its center.

120. Kiln for firing pottery and other ware. CHARLES FREDERICK BAILEY. U. S. 1,465,573, Aug. 21. In firing app. of the class described, three kilns arranged side by side, a chimney common to the three kilns, the center kiln being provided with a horizontal heating flue extending

under it and a heating flue extending around it and communicating with the said chimney at its outlet end and with the horizontal flue at its inlet end, and the outer kilns having heating flues extending around them and communicating at their outlet ends with the said horizontal heating flue, and fire-places arranged at the outer sides of the outer kilns and provided with flues extending under the outer kilns and communicating with the inlet ends of their said heating flues and with the said horizontal heating flue. Cf. *Ceram. Abs.*, **2** [4], 81(1923).

121. Tunnel-kiln oil burner. Gerald Ellis Irons. U. S. 1,465,011, Aug. 14. An oil burner comprising an oil supply pipe with a restricted discharge orifice at its combustion end, a steam jacket surrounding said pipe with an annular discharge orifice surrounding the first mentioned orifice, and a non-metallic refractory shell surrounding the steam jacket and forming an air jacket for the latter, said shell having an air inlet at its outer end and having an opening at its inner end through which the discharges from said orifices may pass.





122. Induced-draft device. Louis Prat. U. S. 1,465,683, Aug. 21. In an induced draft device for chimneys or the like, a plurality of fans, each adapted to deliver a substantially constant volume of fluid into the chimney, and a permanently open discharge nozzle of predetermined size for each fan, disposed in the chimney, to cause the fluid discharged by the fan to carry along the chimney gases in ejector fashion.

Geology

123. Problems in geology of service to ceramics. Wiegand Braun. *Ber. der Deut. Keram. Gesell.*, **4** [1], 36–42(1923).—Examples are given of ways in which geol. sci. can be helpful to ceram., especially in the systematic uncovering of deposits of raw materials used in ceram. and in the development of useful new raw materials. It is also recommended that the ceram. indus. help support geol. research of value to ceram. E. N. B.

124. Kaolin in Mexico. Anon. *Chem. Age*, 9 [218], 14(1923).—The Mexican Govt. has made arrangements for working the numerous and extensive kaolin deposits existing in the country, which constitute an immense source of wealth. Hitherto no attempt had been made to work these deposits, which contain an inexhaustible supply of mat. for manuf. of the finest porcelain. O. P. R. O.

125. On clay. Toshi Suzuki. *J. Jap. Cer. Assoc.*, **370**, 310–4(1923).—Clays are classified in 2 groups, *i. e.*, (1) residual clay and (2) transported clay. Residual clay has chiefly been produced by weathering of feldspathic rocks, although it has often been produced by the action of hot spring or sulphurous vapors. 1. *Residual clays due to the action of weathering.* Clays of Hanasaka and Gokokuji (used in Kutani-ware) as well as that of Izushi (used in Izushi-ware) are kaolins from liparite. Gairome clays produced in the provinces of Mikawa, Owari, Mino and Iga are kaolins from granite. Very plastic reddish brown clay used in Onko-ware is a residue of a calcareous rock whose calcium carbonate has been dissolved away by weathering. 2. *Residual clays due to the action of hot spring or sulphurous vapors.* Some of clays used in the manuf. of Satsuma-ware were produced from augite-andesite by the action of sulphurous vapors and hot spring. Izumiyama clay used in Arita ware is a residue of liparite which was decomposed by the action of sulphurous gases. Tobe clay used in Tobe-ware was produced by combined action of hot spring and weathering on mica-andesite. Clays produced in the manuf. of Aizu-ware as well as amalgatolite of Mitsuishi were produced by the action of hot spring on liparite. 3. *Transported clays.* Fukushu clay is a fire

clay of coal measure. Kibushi clays found in Mino, Owari, Ise and Iga, those used in Banko- and Tokoname stonewares, clay used in Shigaraki-ware, raw material of Awaji faience and many clays used in the manuf. of crude faience as well as architectural potteries are of tertiary origin. Diluvial and alluvial clays are used in the manuf. of Takatori- and Imbe stonewares and most of crude faience, roofing tiles, sewer pipes, common brick, etc. S. K.

126. Diatomaceous earth produced in the Islands of Oki. DENZO SATO. *J. Jap. Cer. Assoc.*, **369**, 264–66(1923).—Geol. of the islands is given in detail. There are 3 large deposits of diatom. earth in the islands. Analyses of typical products are:

Deposit	Insol. matter	Sol. SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	K_2O	Na_2O	Loss	Total
Iinoyama	43.93	37.51	1.17	3.06	0.00	0.19	0.57	0.28	13.06	99.77
Kamo	34.37	48.05	1.38	2.80	trace	.36	.32	.15	12.54	99.97
Minoura	34.25	46.32	0.75	3.60	0.00	.27	.63	.23	13.54	99.59

S. K.

127. Countries producing kaolins. ANON. *Chem. Age* (London), **9**, 11(1923).—*Great Britain.* True kaolins are found in two counties, Cornwall and Devon. The plastic "ball clays" are not to be confused with kaolin or china clay; these are employed in the manuf. of white wares, Dorsetshire. *France.* Deposits of kaolin occur in numerous districts of France. *Germany and Austria.* The kaolins of Ger. are of great industrial importance. *Saxony.* The earliest known occurrence of china clay in Europe was in Saxony. *Czechoslovakia (Bohemia).* Kaolin occurs associated with graphite; the principal area of exploitation lies between Mugrau and Schwarzbach. *Roumania.* Kaolinized formations occur in Roumania; these have not been worked. *Sweden.* The kaolins of Sweden are found in a comparatively limited area in the northern part of Scania (S. Sweden). *Denmark (Bornholm).* Kaolin is found at the foot of the granite plateau, north-east of Ronne. *Spain.* Kaolin-bearing rocks are fairly abundant in Spain, but nowhere are they exploited on a large scale. *Portugal.* In Portugal the name *tierra de vinos* is often given to kaolin. Kaolin-bearing sandstones are recorded in Portugal; also clean white kaolin which is employed for ceram. purposes and the clarification of wine. *Italy.* The kaolin industry of Italy is not well developed, active investigation might reveal many more deposits than at present known. *Russia.* Considerable deposits of kaolinic clays are found in S. Russia. *China.* The raw mat. of the porcelain industry of China possess a peculiar interest, as porcelain was here manufd. centuries before the first was made in Europe. *Japan.* The porcelain clays of Japan were discovered many centuries later than those of China. *India.* High grade kaolin rocks are scarce in India, but white clay is worked on a small scale for many purposes. *The Federated Malay States.* In the Federated Malay States; kaolin of a remarkable purity occurs abundantly. *Australia.* Kaolin mat. is not uncommon in Australia, but it does not appear to have serious commercial importance. *Canada.* China clay is worked in Canada 40 m. northwest of Montreal, Quebec. *United States.* The marketable kaolins of the U. S. are found in the Eastern States, fairly numerous and their value and importance is increasing. They show a great range of varieties, some high-grade clays, but few possessing the qualities peculiar to the best European kaolins. Several white clays are termed kaolins in the U. S., though they may not have the attributes of true kaolins, but may be ball clays, fire clays, or clays more suitable for stoneware. *Africa.* Kaolinized granitic rocks probably occur in many places in Africa, but none has been exploited for kaolin. In the Congo highly kaolinized granite and gneiss are found at the surface, and the kaolin washed therefrom has been employed by the natives as a whitewash. (From J. A. Howe's Handbook of Kaolins.) O. P. R. O.

128. Fluorspar mining in the western states. R. B. LADOO. U. S. Bur. Mines,

Repts. of Investigations, No. **2480**, 35 pp.(1923).—All the known fluorspar deposits of N. M., Ariz., Utah, Calif., Wash., Colo., and Nev. were examined. Descriptions of the individual mines, including their geology, mining and milling methods, flow sheets, and some analyses of the ore, are given. The deposits are so small, or so inaccessible, or the ore is so poor that profitable production of gravel grade of fluorspar, acceptable to eastern steel mills, is not likely to be possible. The production of acid fluorspar in these states, from known ore bodies, probably will not exceed 100 tons annually, that of ground fluorspar will not be more than 3000 tons. E. F. H. (*C. A.*)

PATENTS

129. Process for the manufacture of zinc white. ARMAND NIHOUL and C. CLERC. U. S. 1,463,483, July 31. In the process of manufacturing zinc white, precipitating the zinc in the state of carbonate, re-dissolving said carbonate in an acid solution, and further precipitating the zinc in the state of sulphide by means of hydrogen sulphide gas.

130. Process for the manufacture of alkali-metal silicates. CAMILLE DEGUIDE. U. S. 1,463,037, July 24. The process of producing alkali-metal silicates, which consists in decomposing barium silicate by water and an alkali-metal salt the acid radical of which forms a barium salt less soluble than barium silicate.

131. Manufacture of sodium fluoride. HENRY HOWARD. U. S. 1,464,990, Aug. 14. Process of making sodium fluoride which comprises simultaneously adding hydrofluoric acid and ammonia to a solution of sodium chloride. See following abs. Also *Ceram. Abs.*, **2** [8], 189(1923).

132. Process of making sodium fluoride. HENRY HOWARD. U. S. 1,464,991, Aug. 14. Process of making metal fluoride which comprises simultaneously adding hydrofluoric acid and ammonia to a solution of a salt of a metal which is more soluble than the fluoride of said metal at a relative rate sufficient to maintain the reaction mixture substantially neutral.

Chemistry and Physics

133. Determination of sulphate-, chloride-, and carbonate radicals contained in soda-lime glasses. MASAO IGAWA. *J. Jap. Cer. Assoc.*, **367**, 131–8(1923).—The author proposes the use of acid ammonium fluoride as decompn. reagent in the detn. of sulphuric anhydride, chlorine and carbonic anhydride contd. in glasses. 1. *Prepn. of ammonium fluoride, NH_4HF_2, for the detn. of sulphuric anhydride.* Silicon fluoride obtained by the action of sulphuric acid on ground quartz and ammonium fluoride is introduced into water. After filtering, the soln. is treated with an excess of ammonia, filtered through muslin and evapd. to dryness. Ammonium fluoride, thus obtained, is refined once more by sublimation. 2. *Prepn. of ammonium fluoride for the detn. of chloride.* Ammonium fluoride is purified by treating its soln. with silver nitrate. Then it is sublimed. 3. *Prepn. of ammonium fluoride for the detn. of carbon dioxide.* Ammonium fluoride is dissolved in water and treated with ammonia. The soln. is evapd. after filtration. 4. *Detn. of SO_3.* 3 g. of glass are mixed with about 9 g. of ammonium fluoride, and 5–6 cc. of water are added. The mixt. is evapd. to dryness, treated with sodium-carbonate soln. and filtered. The filtrate is once more evapd. to dryness. It is then extracted with 50% alcohol. The extract is evapd. to dryness, acidifying the soln. with oxalic acid. Sulphuric anhydride in the residue is detd. with barium chloride, after dissolving it with dil. HCl. 5. *Detn. of sulphur.* Total sulphur is detd. just as described above, but the sample must be decomposed in the presence of bromine. 6. *Detn. of Cl.* 5 g. of finely ground sample are mixed with about 15 g. of ammonium fluoride in a platinum basin. The glass is decomposed by adding 30 cc. of water to the basin and heating it at 60–70°C. Chlorine is detd. gravimetrically with silver nitrate, after removing silicic

acid with ammonia. 7. *Detn. of CO_2.* 15–20 g. of coarsely ground glass are put in a lead flask and decomposed by 25–30% soln. of ammonium fluoride. Carbonic acid gas liberated from the glass is absorbed by soda-lime, the app. and procedure being just like those of detg. carbonic acid gas in common carbonates by Fresenius-Classen's method. 8. *Examples of analyses.* Analyses of Belgian and American window glasses are:

No.	Na_2SO_4 (%)	Sulphur in forms other than sulphates, expressed as Na_2SO_4(%)	NaCl(%)	Na_2CO_3(%)
1	0.667	0.046	0.095	0.048
2	.908	.108	.071	.040
3	.068	.027	.154	.055
4	.960	.055	.151	.021
5	1.045	.000	.066	.051

S. K.

134. Fine and research chemicals. C. J. West. Nat. Research Council, *Reprint and Circular Series*, No. **44**, 45 pp.(1923); cf. *C. A.*, **16**, 195, 2633.—This is the second revision. It contains lists of American manufacturers, and of research chemicals, of biol. stains and indicators, of vital stains and of H-ion indicators that can be purchased in this country. E. H. (*C. A.*)

135. Silica studies. I. Loss of water of kaolin and its behavior in solid condition toward carbonates and oxides of alkaline earths. G. Tammann and W. Pape. *Z. anorg. allgem. Chem.*, **127**, 43–68(1923).—These expts. were undertaken on account of the very conflicting nature of the conclusions of other investigators. Data and curves are presented which were obtained in expts. on slimed and carefully washed Oschatz earth dried at 150°. These include dehydration, rehydration of material heated to 600°, behavior of $BaCO_3$ toward Al_2O_3 and kaolin, behavior of $CaCO_3$, $SrCO_3$, BaO, CaO and SrO toward Al_2O_3, SiO_2 and kaolin. Upon losing water at 550° kaolin decomposes into Al_2O_3, SiO_2 and water and at 930° the Al_2O_3, released at 550°, changes into another form less sol. in acids. These conclusions are based on the following evidence: (1) After loss of water at 550° the Al_2O_3 of kaolin is sol. in acids. (2) Heating to 800–900° renders both pure Al_2O_3 and that of kaolin difficultly sol. in acids. (3) Pure Al_2O_3 evolves notable amts. of heat between 850° and 1060°; kaolin at 930° evolves an amt. of heat which is proportional to its content in Al_2O_3. (4) After this evolution of heat the Al_2O_3 becomes denser and the kaolin shows a distinct increase of density. (5) Both Al_2O_3 and kaolin lower the dissociation temp. of alk. earth carbonates at 1 atm. about 220°. (6) Upon heating a mixt. of Al_2O_3 and SiO_2 heat evolution takes place at 940° as on heating kaolin and in both cases the Al_2O_3 becomes difficultly sol., but this same change of soly. is produced by heating Al_2O_3 alone. A. R. M. (*C. A.*)

136. Studies on clays. I. The acidic reaction of Japanese acid clays. Tsuruji Okazawa. *Bull. Inst. Phys. Chem. Research* (Japan), **2**, 189–221(1923).—K. Kobayashi has attributed the acidity of Japanese acid clay to its adsorptive action. O. has proposed a different explanation. Clays have many varied appearances and properties, but may be classified into 3 kinds from their reactivity to salt solns. and acids. When treated with salt solns. or strong acids, the first shows little or no soly., the second none for salt solns. but high with acids, and the third shows high soly. with both. Japanese acid clay belongs to the last class, but is not very different in compn. from common clays. When treated with salt solns., the positive radical in the neutral salt is drawn into the clay particle and Al in the latter is dissolved as a corresponding salt; *e. g.*, when $MgCl_2$ is used as the neutral salt, the reaction may be as follows: R:Al.OH + $MgCl_2$ = R:Mg + $AlCl_2OH$ and $AlCl_2OH + 2H_2O = Al(OH)_3 + 2HCl$, where R is the main radical in the clay; HCl thus produced gives the acidic reaction. This reaction is, therefore, considered to be attributed partly to adsorption and mainly to

double decompn. and the acidity is governed by the salt used, adsorptive and reactive affinities of the clay, stability of the reaction product and reaction velocity, etc. The value of the acidity is not definitely detd. by titrating with alkali. The so-called acidity of the acid clay is decreased greatly by burning at 700–800° for 1 hr. By heating, the state of mol. combination will be changed and Al_2O_3 in the clay will not be dissolved by salt solns. The relation between the burning and the quantity of Al_2O_3 dissolved from the clay by acid is opposite to the above relation. The higher the temp. of burning, the more Al_2O_3 is dissolved, the max. being at about 700–800°; the quantity dissolved is larger than that of other clay. At above 900° the quantity decreases quickly.

K. K. (*C. A.*)

137. The influence of fluxes on the transformations of quartz. N. Parravano and C. Rosselli del Turco. *Gazz. chim. ital.*, **53**, 249–57(1923).—In previous work P. (*Ann. chim. appl.*, **10**, 150(1918)) clarified the nature of the transformations that take place in the burning of SiO_2 refractories, which consists substantially in converting quartzite into varieties having a greater vol., *i. e.*, tridymite, and cristobalite. This transformation occurs with or without the aid of the flux formed from the natural impurities present in the quartzite and of the lime used. After reviewing the existing information P. and T. describe their own expts. in which a quartzite (SiO_2 96.5, Al_2O_3 2.06, CaO 0.80%, Fe_2O_3 trace) was used to which 0.5, 1.0 and 1.5% oxides were added (Fe_2O_3, P_2O_5, B_2O_3, CaO and WoO_3). The brick were heated first 12 days at cone 15 (1430°) and then again for 15 days at cone 18 (1490°). The d. was detd. on the finely ground product. Microscopic examn. as well as the d. detns. showed under the conditions used, of which the absence of alkali was the most interesting, that B_2O_3 has the greatest accelerative action on the transformations of quartz even when only 0.5% is present. Its catalytic activity is so energetic that in practice it ought to be suitably weakened in order to be used advantageously. Fe_2O_3 has a notable catalytic action, perhaps through the formation of silico-ferrites as well as silico-aluminates (from the Al_2O_3 always present) giving mixts. fusible at temps. not too high. In this case the d. does not reveal the phenomena as well as the microscopic observations. E. J. W. (*C. A.*)

138. Adsorbent properties of clay. M. A. Rakusin. *Chem.-Ztg.*, **47**, 115(1923).—Ordinary clay, especially when ignited, possesses adsorbent properties similar to those of kaolin. A 1% soln. of petroleum in petroleum spirit, colored a deep reddish brown, was completely decolorized by standing for 24 hrs. in contact with 5% of ignited clay or 8% of air-dried clay. Suspensions of indigo in aromatic hydrocarbons were colored yellow after this treatment, while suspensions of indigo in petroleum spirit, kerosene, and vaseline oil were colorless. Aromatic hydrocarbons extd. from air-dried clay a yellow oil, insol. in petroleum hydrocarbons. This oil is probably derived from straw and manure kneaded into the clay during its prepn. J. S. C. I.

139. Synthetic aluminium silicate and its relations to kaolin. Robert Schwarz and Albert Brenner. *Ber.*, **56B**, 1433–7(1923).—When dil. neutral aq. solns. of $AlCl_3$ and Na_2SiO_3 are mixed in the ratios varying from 1:0.75 to 1:5 the proportion of SiO_2 in the ppt. increases until the compn. $Al_2O_3.2SiO_2 + 2H_2O$ is obtained after drying at 110°. This ppt. differs from kaolin in that it is comparatively easily decomposed by concd. HCl and loses H_2O at a lower temp. X-ray spectrographs show that 2-day-old and 8-day-old samples were amorphous but that after 8 days a cryst. structure, similar to that of kaolin had developed. D. MacR. (*C. A.*)

140. Influence of surface tension on melting and freezing. Ernst Rie. *Z. physik. Chem.*, **104**, 354–62(1923).—A mathematical paper. The influence of surface tension on the m. p. is investigated thermodynamically, and formulas are deduced for the change in the m. p. A new theory of the structure of glasses is given, and the difference between this and that of Tamann is discussed. H. J. C. (*C. A.*)

141. New diagrams for the valuation of fuel gas and flue gas analysis. WILHELM SCHULTES. *Die Wärme*, **45**, 213–8; *Chem. Zentr*, **1922**, IV, 684.—The diagrams of Ostwald, Seufert and Krämer are complicated in form, are too exact for technical work and do not permit direct graphical readings of the heat losses. By simplifying the formula upon which they are based, a similar representation of the combustion triangle is derived, with diagrams which allow a direct valuation of analysis. C. C. D. (*C. A.*)

142. The three-component system: lime, silica and alumina. R. GRÜN AND K. BIEHL. *Zement*, **12**, 10–1, 18–9, 26–7, 34–5, 44–5, 111–3, 120–1, 126–7(1923).—A phase-rule diagram and a space diagram of the system CaO, SiO_2, and Al_2O_3 are given. $3CaO.SiO_2$, $2CaO.SiO_2$, $3CaO.2SiO_2$, and $CaO.SiO_2$ are the compds. formed by CaO and SiO_2. $3CaO.Al_2O_3$, $5CaO.3Al_2O_3$, $CaO.Al_2O_3$, and $3CaO.5Al_2O_3$ are formed by CaO and Al_2O_3. $Al_2O_3.SiO_2$ is formed by Al_2O_3 and SiO_2. $2CaO.Al_2O_3.SiO_2$ and $CaO.Al_2O_3.2SiO_2$ are formed by the 3 substances. Photomicrographs have been made of various mixts. of the system which show that all of the above compds. have definite cryst. structures. The phys. properties of all the compds. are given. R. F. S. (*C. A.*)

143. Graphic method for computing heat balance. F. A. SHORKEY. *Blast Furnace & Steel Plant*, **11**, 348–54(1923).—A series of graphs is given to replace the use of formulas for boiler-room computations. The charts are based on no CO present and a max. of 19% CO_2, and include (1) detn. of H (2) detn. of volatile C (3) losses due to H_2O (4) losses due to burning of H (5) losses due to combustible in ash and S correction (6) losses due to heat in dry flue gases and (7) losses due to CO in dry flue gases.
C. C. D. (*C. A.*)

144. Estimation of iron in ores and silicate rocks. F. R. ENNOS AND R. SUTCLIFFE. *Summary of Progress Geol. Survey*, **1921**, 174–6.—In the case of samples contg. Fe, Al, Ti and phosphate, fuse the weighed oxides of the Al group with pyrosulfate and est. the Ti colorimetrically in the soln. resulting from the fusion. Then evap. the soln. to a vol. of about 100 cc., destroy the excess of H_2O_2 by treating the hot soln. with the required quantity of H_2SO_3, and sat. the soln. at 90° with H_2S. Sep. the ppt. of S and Pt sulfide (the Pt is derived from the crucible in which the fusion was made) by filtration and wash with very dil. H_2SO_4. Cool the filtrate, oxidize with dil. $KMnO_4$ soln., add 10 cc. of concd. HCl and 5 cc. of 20% NH_4CNS soln., and titrate the Fe with standardized $TiCl_3$ soln. J. C. S. (*C. A.*)

145. Surface tension and adsorption phenomena in flotation. A. F. TAGGART AND A. M. GAUDIN. *Trans. Am. Inst. Min. Met. Eng.*, **68**, 479–535(1923).—Surface tension measurements are described. Frothing is caused by the sol. constituents of the agent. A change of surface tension of the solvent by the solute produces the frothing. When ore is added the viscosity of the mixture is increased and the froth becomes more permanent. The surface tension is not affected in any way by an insol. oil, such as Nujol. The behavior of various flotation oils at the water surface is studied. The adsorption properties at liquid and solid surfaces were studied by using the froth formed and the rejected soln. W. A. M. (*C. A.*)

146. New data on thermochemistry. WOJCIECH SWIENTOSLAWSKI. *Bull. soc. chim.*, **29**, 496–9(1921).—Combining his own results (*C. A.*, **5**, 1414, 1415; *Bull. Acad. Sci. Cracow*, **1909**, 941–72) with those of Fajans (*C. A.*, **14**, 1623), S. deduces values for the heat of formation of any linking such as $(C-X)$ or $(H-X)$ and shows that it may be considered as made up of two parts, one part being produced by the atom $(C-)$ or $(H-)$ and the other by the atom to which it is linked. Values are calcd. for C and the halogen atoms. It is shown that the heat produced by the atom in the formation of a compd. $X-Y$ is not always equal to the heat produced by it in the formation of the simple mol. $X-X$. J. C. S. (*C. A.*)

General

147. Utilization of a waste alumina. Iwazo Takita and Masajiro Wataya. *J. Jap. Cer. Assoc.*, **366,** 98–108(1923).—The research relates to the utilization of impure alumina which is obtained as a waste product in the process of extracting alum from calcined alunite. The waste alumina of the Asada Alum Works, Shikama, Harima, has been used in the expts. 1. *Properties of the waste alumina.* Analysis of the waste alumina is: SiO_2 28.50, Al_2O_3 65.33, Fe_2O_3 0.56, CaO 1.25, K_2O 1.80 and SO_3 2.46%. Refractoriness is over cone 37. 2. *Manuf. of chem. porcelain.* Expts. on the manuf. of chem. porcelain with 7 different bodies and 7 glazes are described. The best result for cone 16 was obtained with No. 1 body and *e* glaze. No. 1 body was composed of 23.2 waste alumina, 33.7 gairome-clay of Tokiguchi, 25.0 ohmishima quartz and 18.1% ohmishima feldspar. Its formula is $0.1036K_2O$, Al_2O_3, $3.1303SiO_2$. Small crucibles were formed by casting a slip composed of 100 raw materials, 0.25 sodium carbonate, 0.08 water-glass and 90 water. The glaze which was applied on their biscuits is $\left.\begin{matrix}0.1K_2O\\0.9MgO\end{matrix}\right\}1.0Al_2O_3, 10.0SiO_2$ in which MgO was added in form of calcined magnesite. The glazed biscuits were fired at cone 16. The products stood various tests better than German crucibles. 3. *Manuf. of glass pot.* Small pots made of 18 different bodies by casting and fired at cones 010a, 8 and 15 were filled with a glass mixt. composed of 38.22 cryst. borax, 12.40 boric acid, 92.04 barium oxide and 36.00 sand; they were heated at cone 8 to compare their resistance to corrosion. Detailed descriptions are given on the procedure and results of the expts. 4. *Manuf. of refractory brick.* Superior brick were obtained by the following process: The waste alumina is ground, pressed into briquettes, fired at cone 18 and reground; brick made of 80% grog and 20% raw Kibushi-clay are fired at cone 16. Their shrinkage was 0.44% in drying and 0.33% in firing. Their refractoriness was over cone 37. S. K.

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CERAMIC ABSTRACTS

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Vol. 2 | December, 1923 | No. 12

Author Index[1] to Abstracts for December

Author	Number of abstract
Adler, H.	15
Anon.	10, 11, 12, 20, 34, 49, 52, 57, 76, 84, 89
Baillie, W. L.	32
Baire	9
Barta, R.	51, 79
Baschant	85
Bigot, F.	83
Boss, J. C.	55
Brown, L.	63
Burger, M.	69
Burgués y Escuder, D. C.	81
Busard, I. B.	39
Callard, R. P.	40, 41
Carrier, W. H.	72
Christie, C. H.	45
Cone, E. and Hale, J. W.	59
Cornille, A.	66
Corning Glass Works	47
Crowley, J. P.	12, 46
Crupi, F. J.	2
Dimbleby, V., Hodkin, F. W., Parkin, M., and Turner, W. E. S.	28
Dimbleby, V. and Turner, W. E. S.	26
Dinsmore, F. W.	63
Editorial	88
Edwards, V. C.	36
Emerson, J. W.	13
English, S.	29, 30
English, S. and Turner, W. E. S.	27
Evans, E.	6
Foltz, A.	63
Gerlach, O.	90
Good, R.	44
Granger, A.	61
Greenwood, W. W.	4
H. C.	9
Hall, F. W.	3
Hallatt, H. H.	65
Hess, H. W.	22
Hogenson, W.	17
Holmes, H. N.	16
Horak, W.	25
Hordk, V.	48
Jeffery, J. A.	68
Jones, W. R.	77
Keppeler, G.	19
Kiefer, E. F.	71
Klinefelter, T. A.	63
Lessell, J. B.	7
Liston, N. A.	35
M. E. P.	5
McDougal, T.	63
Meyers, T. A.	60
Miller, E.	43
Minton, R. H.	63
Nakamura, K.	62
Norsk Aluminum Co.	82
Owens, M. J.	38
Poppenhusen, H. A. and Strong, A. P.	61
R. M.	8
Reqna, R. S.	53
Research Staff of Gen. Elec. Co.	31
Richmond, H. A. and Macdonald, R., Jr	1
Rittman, A. J.	21
Ryde, J. W. and Huddart, R.	31
Schwerin, B.	91
Searles-Wood, H. D.	50
Seede, J. A.	70
Singer, F.	86
Smith, W.	58
Steinberger, L.	67
Sullivan, A. P.	14
Teisen, T.	74
Thiesen, T.	24
Treat, F. H.	75
Turner, E.	63
Turner, W. E. S.	23
Ver Mehr, J.	54
Wallace, F. S.	56
Warga, K.	18
Weigel, O.	80
Whittemore, J.	37
Wilhelm	78
Withey, W. H.	33
Wolever, F. H.	73
Worcester, W. G.	87

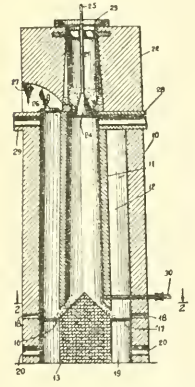
[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

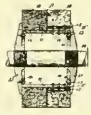
PATENTS

1. Aluminous abrasive and method of making the same. HAROLD A. RICHMOND and ROBERT MACDONALD, JR. U. S. 1,467,590, Sept. 11. In the manuf. of artificial corundum the improvement which consists in regulating the percentage of titanic anhydride in it to control the resist. to fracture and to adapt it to various grinding and polishing operations while providing appreciable quantities of both silica and iron oxide in the product.

2. Method of making abrasive articles of manufacture and product. FRANK JOSEPH CRUPI. U. S. 1,468,960, Sept. 25. The herein described method of making abrasive manufactures consisting in coating a backing with a solution of glue; in applying abrasive material to the glue coating; in coating the glue and abrasive coating with a colloidal, waterproof, adhesive composition containing rosin, glue, phenol, acetic acid and water in about the proportions stated, and in which the acids prevent coagulation of the glue.



3. Apparatus for the manufacture of aluminum chloride. FRANK W. HALL. U. S. 1,468,632, Oct. 2. App. for the manuf. of aluminum chloride comprising a retort, a combustion chamber about the retort adapted to supply heat thereto, a discharge outlet from the retort to the combustion chamber and means for maintaining ash from the retort about said outlet so as to form a gas-tight seal.

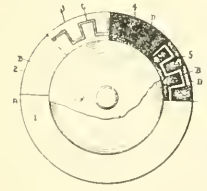


4. Segmental abrasive wheel. WALLACE W. GREENWOOD. U. S. 1,469,723, Oct. 2. A grinding wheel comprising a cylindrical drum adapted to be mounted concentrically on the wheel spindle, abrasive segments mounted thereon and forming a cylindrical grinding surface, each of said segments having a projecting lug on an inner portion, and clamping means including a removable wedge to engage said lug with adjustable press. and replaceably fasten the segment to said drum.

Art

5. Greek terra cottas. M. E. P. *Bull. Met. Mus. Art*, **18** [9], 212(1923).—Seven examples of Greek koroplastic art lately acquired for the Museum are described. Illus. ED.

6. The trend in modern American ceramics. ERNESTINE EVANS. *Shadowland*, **7** [2], 58(1923).—A few of the eminent painters are turning to the potter's craft in their search for a new medium, thus overcoming the danger of the *commonplace* in American pottery. ED.



PATENT

7. Manufacture of ornamented ware. JOHN B. LESSELL. U. S. 1,467,111, Sept. 4. The method of treating the surfaces of glass, pottery, porcelain, metal, and like articles, which consists in applying to the article, a mat. of selected outline which will not fuse, applying thereon and over the said mat. a fluid containing the desired coloring matter, firing the article to fuse the coloring matter, and then removing the said mat. and coloring matter thereon from the article.

Cement, Lime and Plaster

8. Italian cement plants. R. M. *Rev. Mat. Constr. Trav. Pub.*, **166**, 160–2(1923).—Detailed list of the important 48 concerns, controlling about 70 plants, that manuf.

natural cement and Port. cement, giving their individual annual production, their main products, and the numbers and types of fur. in use. The total production amts. to 1,700,000 short T. annually. Their mechanical equipment is mainly of Ger. origin L. N.

9. Franco-Belgian association for testing materials. Session of June 23, 1923. H. C. *Rev. Mat. Constr. Trav. Pub.*, **166**, 165–7(1923).—*Influence of low temperature on the hardening of mortars, after setting.* (Mr. Baire.) Specimen of 5 cm. cubes, made of cements and mortars were inclosed, after setting, in soldered zinc containers. One set of containers were put in an ice-making calcium chloride bath, having an av. temp. of —6° to —8° C. The other set was kept at an av. temp. of +14°. At various time intervals containers were opened and the specimens tested. The following are results for a mortar of an aluminous cement:—

	Days				
	1	2	3	7	28
Tensile Strength					
Temp. Normal	17.5	20.5	19.7	25.2	28.2
Temp. below freezing	17.5	17.5	18	20.2	20.5
Compressive Strength					
Temp. Normal	165	215	275	340	385
Temp. below freezing	165	195	212.5	260	255

It is concluded that low temp. affects the hardening of hydraulic binders, due to the effect of temp. on chem. reactions, and that the variation in resistance between specimens held at different temps. depends upon the binder, the fused cement being relatively less influenced by low temps. than slag cement. L. N.

10. Concrete-lined pipes. Anon. *Indus. Australian & Mining Standard*, **70**, 280(1923).—A process has been devised by a Brit. firm for applying a lining of concrete to cast iron pipes, thereby eliminating the formation of deposits even from bad water. This is accomplished by a new mach. in which the pipe to be lined is rotated at high speed so that the concrete is driven into place by centrifugal force. A lining from $1/2$" to 1" in thickness is obtained according to requirements, and pipes of all diam. from 4" to 72" have been lined successfully. O. P. R. O.

11. Quick-setting cement. Anon. *Can. Eng.*, **45**, 362(1923).—Tests have been made with *ciment fondu* at the Conservatoire Nationale des Arts et Metiers with a view to fixing safe working stresses for this mat. when used for reinforced concrete. Up to the present the same amt. has been used, as if Port. cement were used, but these expts. show that not nearly as much is required. The mixt. used in the expts. consisted of 800 l. of gravel, and 400 l. of sand, mixed with 300 kg. of Port. cement, and with either 300 kg. or 200 kg. of *ciment fondu*. Cubes made with the Port. cement tested at 3 mos., broke under a load of 155 kg. per sq. cm., while at 6 mos. the strength had risen to $163\,1/2$ kg. per sq. cm. Corresponding cubes of concrete had at 3 days a strength of 324 kg. per sq. cm., which in 3 mos. had risen to $362\,1/4$ kg. per sq. cm. Hence at 3 days the strength was equal to that of the Port. cement concrete at 3 mos. With the weaker mixt., contg. 200 kg. of *ciment fondu*, the strength at 3 days was 242 kg. per sq. cm.; at 3 mos., 252 kg. per sq. cm., and at 6 mos., 257 kg. per sq. cm. O. P. R. O.

PATENTS

12. Manufacture of artificial stones. Anon. Ger. Pat. 144,706. According to this invention light and highly porous bodies produced from blast fur. slags and similar scoriae, with the addn. of lime or cement to act as a binding agent, are hardened by the action of either low or high press. steam immediately after molding and setting according to the preliminary setting thereof. (*Quarry & Surv. & Contractors' Jour.*) O. P. R. O.

13. Hardened water-repellent gypsum plaster and method for producing the same. JOSEPH W. EMERSON. U. S. 1,470,260, Sept. 25. An article of manufacture comprising "set" or hydrous gypsum plaster, the pores of which are substantially filled with sulphur.

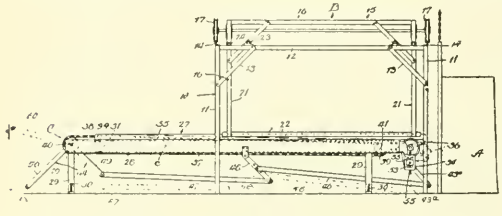
14. Electrical cement. ALAN P. SULLIVAN. U. S. 1,468,930, Sept. 25. An elec. cement comprising more than 80% of copper powder together with magnesium chloride and magnesium oxide.

Enamel

PATENTS

15. Process for removing enamel from old and new enameled articles. H. ADLER. Ger. pat. 374,114, Jan. 17, 1922. Iron shot, quartz, sand, or the like, is forced through steel tubes by compressed air on to the surface of enameled articles contd. in a closed chamber. (*Jour. Soc. Chem. Ind.*) O. P. R. O.

16. Removal of scale and rust from iron and steel. HARRY N. HOLMES. U. S. 1,470,225, Sept. 25. The method of removing rust or scale from iron or steel, consisting in pickling the same in an acid bath containing at least one-fifth of 1% by volume of an aldehyde to inhibit the attack of the acid upon the base metal.



17. Charging apparatus for enameling furnaces. WILLIAM HOGENSON. U. S. 1,468,944, Sept. 25. Charging app. for enameling fur., comprising in combination, a carriage having a removable work carrier, a furnace charging fork, arranged to receive said work carrier when the latter is moved over said charging fork, tracks, for supporting one end of the fork, and depressible rollers for supporting the other end of the fork.

18. Enameling. K. WARGA. Brit. 191,771, Aug. 16, 1921. Multicolor decorations, designs, lettering, etc., are printed on surfaces of Al or Al alloy and enameled. Films comprising mixts. of mineral colors or pigments and vitreous flux with a liquid or viscous vehicle are printed successively on the metal surface, the melting points of the mixts. being so arranged that the mixt. adjacent the metal surface has the lowest m. p. and the m. p.'s of the successive films rise progressively. The metal surface is oxidized prior to printing and the films are fixed by firing in a kiln in which a temp. corresponding to the highest m. p. is maintained. (*C. A.*)

Glass

19. On the relation between the composition and chemical resistance and chemical attack of glass. G. KEPPELER. *Zeits. f. ang. Chem.*, **51**, June 27, 1923.—The surface deposit is mostly a thin layer of soda crystals. Soda is dissolved out of the glass by water and combining with CO_2 from the air forms Na_2CO_3. Several microscopic tests verify this assumption. The devitrification of old glass is not due to a change in structure arising from crystallizing forces, but to hydrolysis. In the case of complex glasses he hopes to det. the laws governing soly. which may be attributed to individual oxides. By introducing equi-molecular portions of CaO, SrO, and BaO he found for certain percentages a practically insol. glass was attainable by the use of CaO, while the introduction of SrO and BaO did not attain practical insoly. Further expts. in substituting boric acid for silica were only briefly mentioned. W. M. C.

20. Production of glass wool. ANON. *Le Verre*, **3** [7], 1923; *Keram. Rund.*,

31, 338(1923).—The production of glass wool by means of a machine made by the Duplex Machine Co., Marktrewitz, is described. H. G. S.

21. The why and wherefore of seedy glass during melting. A. J. RITTMAN. *Glass Worker*, **42** [42], 19(1923).—Seeds are suspended gas in the glass and come from the raw mat. Increased ht. or change of batch to lower melting temp. will correct this fault. R. J. M.

22. New glass furnace types in England and Europe. H. W. HESS. *Glass Worker*, **42** [44], 11(1923).—Twelve pot recuperator fur. are being used with success. Greater economy is claimed. R. J. M.

23. Specifications in the British glass industry. W. E. S. TURNER. *Glass Worker*, **42** [45], 11(1923).—From *The Pottery Gaz. and Glass Trade Review*. The need of standard specif. for glass food containers is urged. R. J. M.

24. Treatise on the design of pot arches. T. THEISEN. *Glass Worker*, **42** [47], 11(1923).—Paper before the Brit. Soc. of Glass Tech. Improved types of pot arches to obtain more even heat and higher temp. are discussed. R. J. M.

25. Resistant glass. *Le Verre*, **3**, 183(1923). French pat. 548,253. **Procedure for making a resistant glass.** W. HORAK. March 6, 1922. (Czecho-Slovakia, Feb. 4, 1922).—The chem. compn. in per cent is sand 60–70, boric acid 15–30, potassium carbonate 1–2, sodium carbonate 3–6, kaolin 2–6, mica 0–4, zirconium oxide 1–3, titanic acid (oxide) 1–3, having the following approx. mol. compn. $70SiO_2.20B_2O_3.3RO.-{}^1/_2Al_2O_3.ZrO_2$ (where R = NaK). The glass has a small coeff. of expansion and withstands sudden heating and cooling. (Manufactures of this glass have been given the trade name of "Resista" in Europe.—Abstr.) L. N.

26. The analysis of glasses rich in boric oxide. V. DIMBLEBY AND W. E. S. TURNER. *Jour. Soc. Glass Tech.*, **7** [25], 76(1923).—A method of analysis of sodium boro-silicates of high boric oxide content is described which eliminates errors due to volatilization. J. G. P.

27. The influence of boric oxide on the annealing temperature of boro-silicate glasses. S. ENGLISH AND W. E. S. TURNER. *Jour. Soc. Glass Tech.*, **7** [25], 73(1923).—It is well known that the boro-silicate glasses of which present day chem. glassware is made need a comparatively high temp. for their annealing. Observations point toward boric oxide as the probable cause of the high annealing temp. of commercial boro-silicates. Expts. were conducted on 2 series of sodium boro-silicates, 1 series with 20% Na_2O and variable B_2O_3, the other with 10% Na_2O and variable B_2O_3. The annealing temp. were detd. on samples of rod with plane polished ends as used in previous investigations. The results clearly indicate in the case of the glasses with approx. 20% of Na_2O that as silica is substituted by boric oxide, the annealing temp. rises, reaches a max. at about 16 or 17% of the oxide and then steadily falls. In the case of the glasses with 10% sodium oxide, the values for the glasses exam'd. fall continuously. J. G. P.

28. A study of the melting and working properties of boric oxide glasses with special reference to the boro-silicates. V. DIMBLEBY, F. W. HODKIN, M. PARKIN, AND W. E. S. TURNER. *Jour. Soc. Glass Tech.*, **7** [25], 57(1923).—Meltings were carried out on 3 series of sodium boro-silicate glasses contg. approx. 20, 10 and 5% sodium oxide. In each series the amt. of sodium oxide was maintained approx. constant while the silica and boric oxide portions were varied. In the first series 9 glasses were prepd. contg. from 0 to 45% boric oxide; in the second series 8 different meltings were made and the amt. of boric oxide ranged from 15 to 50%; in the 3rd series involving 7 meltings the range of boric oxide tested was from 20 to 45%. It was found throughout the range that homogeneous glasses could be prepd. and there was no segregation in layers of different compn. Boric oxide beyond a certain amt. does not make for dura-

bility but the reverse. With increasing boric oxide in each series and diminution in the amt. of silica, the rate at which melting and refining occurred increased rapidly. Soda ash has considerably greater fluxing action than has borax or boric oxide. The rate of change of viscosity increases very greatly as silica is substituted by boric oxide. There was considerable loss of boric oxide through volatilization. All glasses of the 20 and 10% series examd. could be worked readily in a blow pipe and showed no signs of devitrification. J. G. P.

29. The effect of various constituents on the viscosity of glass near its annealing temperature. S. ENGLISH. *Jour. Soc. of Glass Tech.*, **7** [25], 25(1923).—Measurements of the mobility of soda-lime, soda-magnesia and soda-alumina glasses, 1 soda-lead oxide glass and 1 potash-lead oxide glass show that in spite of their variability in working properties, the rate of change of viscosity near their annealing points is almost constant. The mobilities were obtained by measg. the rate at which rods were stretched under the action of a wt. at certain fixed temps. A description of the method and app. is given. The rise of temp. necessary to reduce the viscosity by $^1/_2$ in this range being 8° for 2 glasses, 9° for 10 glasses, 10° for 3 glasses, 11° for 2 glasses and 12° for 1 glass. Twyman's equation is shown to be nearly correct for the range of temp. near the annealing point, especially for the softer glasses. The results indicate that the mobility is approx., but generally not accurately, a logarithmic function of the temp. and that at higher temps. than those used in this investigation the mobility temp. curve for most if not all glasses will have a point of inflection which will to a certain extent det. the sweetness or otherwise of the glasses in their working ranges. Sweetness depends on 2 factors (1) the rate of change of viscosity with temp. and (2) the rate at which ht. is lost by the glass at its working temp. J. G. P.

30. An examination of some current views on the detection of strain in glass. S. ENGLISH. *Jour. Soc. Glass Tech.*, **7** [25], 20(1923).—Strain is not detected in glass by polarized light if the direction in which the stress is acting is parallel to, or at right angles to the plane of polarization of the light incident on the glass. For the best results the glass should be held so that the direction of the stress is at 45° to the plane of polarization of the light. Objections to several marketed strain viewers are made. Strain viewers should be designed so that no light can pass directly from the source to the analyzing nicol and no light from the source can strike the object being tested and be reflected to the eyepiece, otherwise untrustworthy indications are liable to be obtained. J. G. P.

31. Analysis of bubbles in glass. RESEARCH STAFF OF GEN. ELEC. CO., LONDON (J. W. RYDE AND R. HUDDART). *Proc. Phys. Soc. London*, **35**, 197–8(1923).—In order to distinguish bubbles generated by chem. action in glass from those introduced by mech. processes, spectroscopic tests are made for the presence of N. To liberate the gas from the bubbles, a specimen of the glass is placed in one limb of a quartz U-tube and Hg in the other, and the glass is heated and then disintegrated by sudden cooling, the tube being plunged into cold H_2O at the same time that the Hg is thrown on to the glass. C. C. V. V. (*C. A.*)

32. Some aspects of the autoclave test for durability of glass. W. L. BAILLIE. *J. Soc. Glass Tech.*, **6**, 279–88(1922); cf. *C. A.*, **16**, 2204.—Durability depends not only on the corroding agent employed, but on the method of manuf. and the purpose for which the ware is designed. The use of accelerated tests possibly introduces disturbing factors. The use of glass powder is not recommended, as the surface exposed cannot be estd., there being no simple relation between sieve grading and grain vol. Further, cementation between grains probably occurs when the decompn. becomes extensive and this prevents both free access of the corroding agent to the whole surface and the removal of all the alkali in the final washing stage. The autoclave test executed on finished pieces

of suitable size, or on test blocks cut from finished ware and having the cut surfaces weathered for some time before use, is flexible and capable of producing results in close agreement. Steam is recommended in preference to water as a corroding agent, and times and pressures are conveniently varied to suit the type of glass under test. Thus a series of glasses may be sharply differentiated at 4 atm. pressure, while at 10 atm. all may be equally bad, in which case 4 atm. will be a suitable pressure for the test. Rise of temp. does not accelerate the action of steam on all glasses to the same extent, which may be due to the fact that decompn. is the result of two reactions differently accelerated by temp. rise. The effect of increasing the pressure is not so easily accounted for. It is suggested that high pressures may promote reactions which do not occur at pressures nearer atm. *E. g.*, Turner (*C. A.*, **16**, 4026) found that with glass rich in alkali the alky. at 5 atm. was greater than that at 25 atm. J. S. C. I.

33. Use of the autoclave test as a method of testing glassware. W. H. Withey. *J. Soc. Glass Tech.*, **6**, 289–91(1922).—While of very great use for glasses designed for contact with steam or water under pressure, the autoclave test in general is much too severe for ordinary ware. Two glasses alike in their resistance to attack at a low temp. may differ at a higher temp. and the order of their difference may be inverted at a still higher temp.; under the appropriate conditions suited to their characteristics both may be equally good. Tests described on a Zn boro-silicate and a lime boro-silicate glass showed that under prolonged treatment the former flaked, continually exposing a fresh surface to the corroding agent, while the latter acquired a "bloom" through which the corroding agent had to penetrate to reach the glass surface. J. S. C. I.

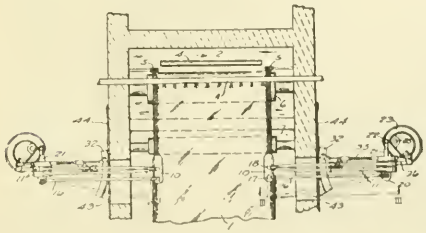
34. Lubrication of glass-making machinery. Anon. *Glass Ind.*, **4**, 130–1(1923). *C. A.*

PATENTS

35. Apparatus for making wire glass. Noah A. Liston. U. S. 1,466,025, Aug. 28. An app. for making wire glass, which includes a roll formed of series of annuli or rings mounted on a core, the said rings having serrations, the serrations on one ring being out of horizontal alignment with the serrations on the adjacent ring.

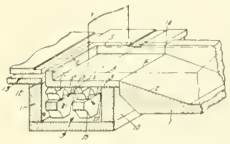
36. Reinforced glass. Victor C. Edwards. U. S. 1,467,030, Sept. 4. As a new article of manuf., a reinforced glass structure comprising the combination of a transparent sheet of a pyroxylin compn. with a transparent sheet of glass capable of absorbing those actinic rays of light which tend to induce an appreciable color change in said pyroxylin compn.

37. Method and apparatus for drawing and flattening sheet glass. James Whittemore. U. S. 1,466,460, Aug. 28. In an app. for drawing and flattening sheet glass, a receptacle containing a mass of molten glass from which the sheet is drawn upwardly, means for bending the drawn sheet into a horizontal plane, means for reheating and softening the sheet, means for applying the longitudinal draft to the sheet, and means for grasping the edge portions of the softened sheet between the bending device and the drawing means, and stretching the sheet laterally to flatten the same and remove waves and wrinkles.

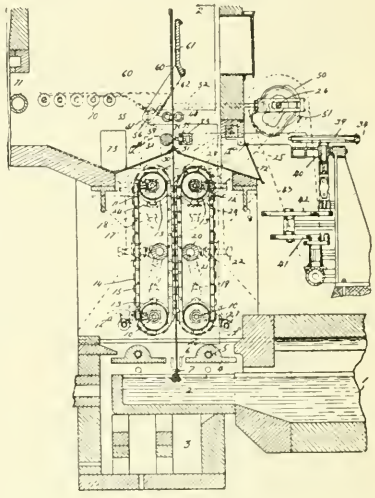


38. Sheet-glass-drawing mechanism. Michael J. Owens. U. S. 1,466,457, Aug. 28. In a sheet glass drawing machine, in combination with a draw-pot containing

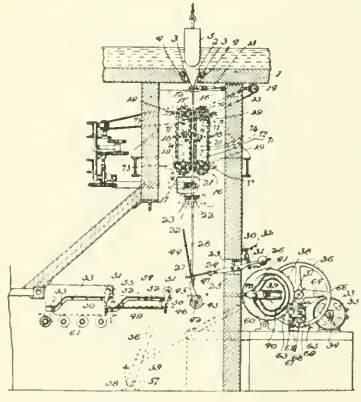
the molten glass from which the sheet is drawn, a transverse supporting member beneath the pot positioned parallel to the line of draw of the sheet, the member having its under side cut away to form a series of open arches, and its upper pot-supporting side beveled at the edges leaving a narrow continuous strip in unbroken contact with the pot.



39. Sheet-glass drawing and delivering mechanism. INGLE B. BUSARD. U. S. 1,466,421, Aug. 28. In an app. for drawing sheet glass, means for drawing a sheet of glass vertically, a horizontal leer conveyor, means for scoring the continuously advancing sheet at spaced intervals, a clamping plate movable against one face of the sheet to break off the section at the score, a supporting frame against which the severed sheet section is clamped by the clamping plate, means for successively moving the clamping plate against the sheet, swinging the plate, sheet section and frame into a horizontal plane, and quickly returning the clamping plate to its vertical position, the carrier frame remaining in horizontal position until it has delivered the sheet section to the leer conveyor, then returning to receive the next sheet section. In combination, means for drawing sheet glass and means for scoring the sheet at right-angles to its length as it is being drawn comprising an endless carrier, a scoring device carried thereby, means for intermittently driving said carrier, and means for guiding said endless carrier obliquely across the face of the moving sheet, the inclination of said guiding means being adjustable to conform to the speed at which the sheet is drawn.

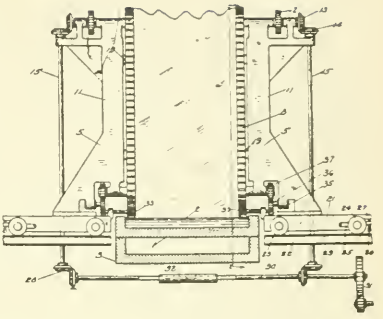


40. Sheet-glass-drawing mechanism. ROBERT P. CALLARD. U. S. 1,469,379, Oct. 2. In a mach. for drawing sheet glass, the combination of a receptacle for molten glass having an oblong slot or opening in the bottom thereof, water-cooled channels arranged on opposite sides of said opening to regulate the temp. of the glass flowing through said slot or opening, width-maintaining means, vertically moving sheet-drawing mechanism drawing the sheet downward, intermittently-operated scoring mechanism for scoring the drawn sheet, and an intermittently-operated carrier for breaking the sheet along the scored line, and a carriage to which the severed section is delivered by said carrier.

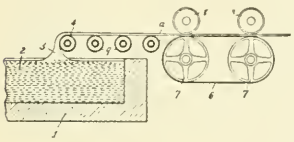


41. Drawing continuous sheet glass. ROBERT P. CALLARD. U. S. 1,469,380, Oct. 2. In combination, means to hold a supply of molten glass from which the glass sheet is formed, a pair of opposed chains at each edge of the sheet for gripping the sheet and continuing in gripping engagement therewith during a predetermined length of

movement of the sheet, and sep. means carrying and guiding the movements of the pairs of chains and adjustable to dispose the sheet gripping flights of the chains parallel to the longitudinal centerline of the sheet or at an angle thereto.

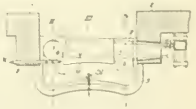


42. Method of and apparatus for producing continuous sheet glass. JOSEPH P. CROWLEY. U. S. 1,469,383, Oct. 2. In a sheet glass producing app., a source of molten glass, a graphite-clay hopper into which the glass flows from the source, there being a slot in the bottom of the hopper through which the glass flows in sheet form, a graphite-clay slab below the hopper, having a concave outer surface for deflecting the sheet into a horizontal plane, and drawing and flattening mechanism for carrying away the sheet.

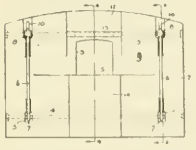


43. Glass-feeding mechanism. EDWARD MILLER. U. S. 1,470,023, Sept. 25. The combination with the discharge spout of a glass tank having an outlet opening of a mold adapted to be located at a lower level than the spout but not in vertical alignment with the opening thereof, means held stationary with relation to the mold for receiving the charge of glass and guiding it to the mold, and means for controlling the movement of the glass from the spout to said glass receiving and guiding means including a member having an opening through which the glass is adapted to flow, a knife for severing the glass, a shear arm mounted below the spout under the discharge opening from the spout, means for reciprocally mounting the knife on the underside of said shear arm in position to sever the glass and temporarily close the bottom of the opening through the shear arm to form a cup for temporarily supporting the unsevered portion of the glass, and means for elevating the shear arm after the glass has been severed.

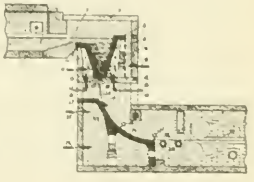
44. Manufacture of glassware. ROBERT GOOD. U. S. 1,469,457, Oct. 2. In app. for making articles of glass, a fur. or tank, a channel for the molten glass communicating at both its ends with the main body of the glass in the furnace, means for causing the molten glass to flow through the channel, the breast of the fur. immediately above the inner edge of said trough being slotted to permit the escape of ht. from within the fur. chamber to maintain the glass in the trough in a highly heated condition.



45. Door for glass-pot furnaces. CHARLES H. CHRISTIE. U. S. 1,469,358, Oct. 2. A fur. door comprising a body portion made up of refrac. mat., longitudinally extending metal rods embedded in said refractory material, said rods being exposed for a portion of their length near the ends thereof, and upright rods on the outside of said door engaging said rods at the exposed portions, and connecting means at the upper ends of said rods for attaching lifting chains.



46. Method of making sheet glass. JOSEPH P. CROWLEY. U. S. 1,469,382, Oct. 2. The method of forming sheet glass consisting in drawing a mass of glass from a molten source, passing the mass laterally while in a highly heated plastic condition over a bend-



ing member and extending it lengthwise to form a sheet before it cools sufficiently to lose its plasticity.

47. Glass manufacture. CORNING GLASS WORKS. Brit. 192,919, Feb. 7, 1922: The colors due to metallic salts in glasses, particularly the borate glasses colored by CoO or NiO, are modified by adding a substance or substances contg. one or more of the halogens. When KCl is added to the batch of glass contg. a very high proportion of boric oxide and colored with CoO, the resultant glass has a green color instead of red. The color change is less noticeable when the proportion of boric oxide in the glass is low or when other halide salts are used instead of the chloride. (*C. A.*)

48. Glass manufacture. V. HORDK. Brit. 112,713, Feb. 5, 1923. A resistance glass is made from a batch contg. 60–70% of SiO_2, 15–30% of boric oxide, 1–2% of K_2CO_3, 3–6% of Na_2CO_3, 2–6% of kaolin, up to 4% of mica, and 1–3% of an oxide of the silicon group, *e. g.*, Zr or Ti. The glass is stated to have a low coeff. of expansion, a high fusing point, and great resist. to chem. action. (*C. A.*)

Heavy Clay Products

49. Highly porous insulating brick. ANON. *Brit. Clayworker*, **32**, 169–70(1923).—Brick having a high porosity are used for insulating purposes for (*a*) in houses, offices and other buildings, in order that a thin wall may be used as effectively as a thick wall for keeping rooms warm in winter and cool in summer; (*b*) as sound absorbers, to insulate rooms which are required to be quiet, from places which are noisy; and (*c*) in fur. and kilns in order that high temps. may be maintained with a minimum fuel consumption. Bricks of the (*a*) and (*b*) types are made of red-burning plastic clay, to which a large propn. (usually an equal volume) of fine hardwood sawdust, seeds, ground lignite, or peat, coal dust, locomotive ashes or other combustible material has been added. For building purposes a highly porous brick measuring 9″ by $4^1/_2$″, by $2\ ^5/_8$″ ought not to weigh more than 5 lbs. and should have a crushing strength of about 90 tons per sq. ft. Insulating brick for fur. are made by mixing kieselguhr with 10 to 20% clay. Instead of a clay bond, lime may be used as in the manuf. of silica brick. The propn. of lime required for these is usually about 6% while that required for silica brick is only 2%. H. G. S.

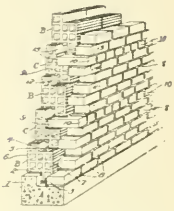
50. Sand lime brick. H. D. SEARLES-WOOD. *Brit. Clayworker*, **32**, 22(1923).—A high Ca lime is best for sandlime brick. This should analyze 90–95% CaO with less than 0.5% MgO. The av. crushing strength requirements for different uses are as follows: engineering brick = 2800 lbs. per sq. in.; brick for external walls = 2000 lbs. per sq. in.; and brick for internal walls = 1000 lbs. per sq. in. H. G. S.

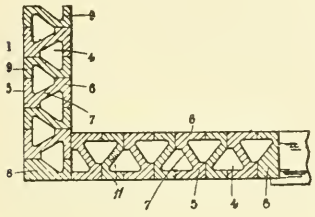
51. Building material industries in Czechoslovakia. RUDOLPH BARTA. *Rev. Mat. Constr. Trav. Pub.*, **166**, 162–3(1923).—Czechoslovakia produces annually 2,000 million brick and 200 million tile in 700 large plants; 220,000 short tons of kaolin, 75% being exported to Ger.; 33,000 tons of porcelain in 70 plants, 70% being exported mainly to the Balkans and the U. S.; 440,000 tons of refractory brick; 22,000 tons of faience; 60,500 tons of common and chemical stoneware; 99,000 tons of slabs; 550,000 tons of Portland cement; 990,000 tons of lime. L. N.

52. Kieselguhr mining. ANON. *Oil & Colour Trades Jour.*, **54**, 823(1923).—A company has recently been formed in Sweden for the exploitation, for use as a building mat., of the large deposits of kieselguhr in the polder of the former lake of Jallasjo, near Vanas Sag, in the Province of Kristianstad. This deposit differs from all others in that there is a natural intermixture of about 20% bituminous products, which form an excellent binding material. O. P. R. O.

PATENTS

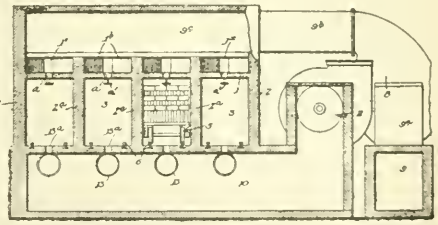
53. Hollow-tile wall construction. RICHARD S. REQUA. U. S. 1,467,117, Sept. 4. A wall structure of brick facing having a header course and hollow-tile backing, the tile being of substantially Z form with the tile opposite the header course of brick broken away to receive the header brick, the tile above such header brick being of normal form and resting directly upon such header brick.



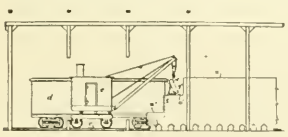


54. Building brick, block, and the like. JOHN VER MEHR. U. S. 1,468,892, Sept. 25. A structure composed of blocks of substantially Z or S shape in plan, arranged in courses one above the other the blocks in a course being assembled or arranged alternately in Z and S formation each alternate block being of less width than the adjacent blocks and constituting a header block.

55. Apparatus for drying brick and other clay articles. JOHN C. BOSS. U. S. 1,468,990, Sept. 25. Apparatus for drying brick and other clay products comprising a series of closed tunnels arranged side by side and having means for admitting loaded cars thereto, conduits above and beneath said tunnels, and communicating therewith, a transverse flue located above the upper conduits and communicating therewith, a blower for supplying heated air under pressure to said transverse flue, a second transverse flue beneath the tunnels communicating with all of said lower conduits, and a suction fan for exhausting air from said second transverse flue.



56. Method of and means for handling and hacking bricks. FRED S. WALLACE. U. S. 1,469,200, Sept. 25. The method of hacking bricks, which consists in assembling in a conveyor at the kiln a complete vertical tier of such bricks the full width of the coöperating carrier, moving the conveyor and contained bricks to said carrier, and placing said tier of bricks as a whole upon the carrier, substantially as set forth. A conveyor for hacking bricks, comprising a wheeled truck, a support for a separate bottom row of bricks, means for withdrawing said support, and a plurality of stationary arms adapted to sustain a vertical tier of bricks, substantially as set forth.



Refractories

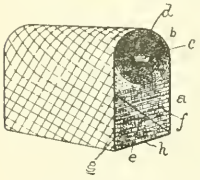
57. Magnesite production in Austria. ANON. *Brit. Clayworker*, 32, 174(1923).—The Austria-American Magnesite Co.'s works at Radentheim in Carinthia. The deposit lies on a plateau at an altitude of 1700 m. From here magnesite is transported by aerial cable 9 km. long. Grading and selecting is unnecessary. It is calcined at 1600–1700°C. One of the rotary kilns is 50 m. long and has a diam. of 1.8 m., its output being 55 T. of calcined magnesite in 24 hrs. Another kiln is 100 m. long and has a diam. of 2.85 m., its output being 200 T. per day. The coal consumption is 30 to 40%

of the output tonnage and is introduced in the pulverized form. The calcined product analyzes between the following limits: MgO = 85–88%, CaO = 1.5–2.5%, Fe_2O_3 = 4–5%, Al_2O_3 = 1–5%, SiO_2 = 4–6%. As the fumes are injurious to vegetation the spent gases are carefully purified before being released into the air. Attached to the works is a brick plant where calcined magnesite is mixed with 5–7% water and pressed in to brick with a press. of 1000 kg. per sq. cm. They are then fired at 1500–1520° C in a fur. tunnel through which they are passed. H. G. S.

58. A new refractory material. W. Smith. *Tonind.-Ztg.*, **47**, 530(1923).—Clay is impregnated with C by heating it together with coal at low temps. The clay thus treated may be bonded with tar and the products made in this manner are fired before using. It is claimed that this will make an excellent refractory being very resistant to slag action. H. G. S.

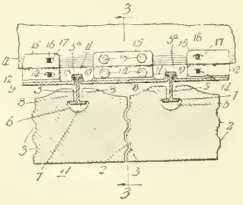
PATENTS

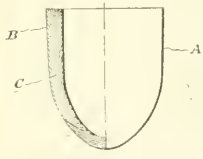
59. Refractory furnace linings. E. Cone and J. W. Hale. Eng. pat. 199,144, March 17, 1922. The inner lining of the fur. is constructed of a wall, one brick thick and the space between it and the outer wall filled with a rammed-in plastic mass of the compn.; graphite 50, fireclay 25, silica rock 5, magnesite 5, anhydrous gas tar sufficient to render plastic. Alternatively the plastic mass may extend with the brickwork in layers to the inner surface of the furnace. The method is applicable to basic, neutral, or acid refrac. mats. (*Jour. Soc. Chem. Ind.*) O. P. R. O.



60. Packing for pistons. Theodore A. Meyers. U. S. 1,467,113, Sept. 4. An expansible packing embodying a resilient section provided with a tubular rubber core, a pair of parallel fabric body triangular sections, and a jacket for assembling said sections as a unit.

61. Firearch. Herman A. Poppenhusen and Arthur P. Strong. U. S. 1,466,751, Sept. 4. A firearch, comprising an upper structure, a plurality of contacting tiles arranged in rows beneath the same. I-beams engaged with said tiles and projecting above the same, plates extending between and engaged with said I-beams above said tiles for suspending the I-beams from said plates, said plates extending over the joints between said tiles for preventing the downward passage of air between said tiles, means for preventing the passage of air between said plates and I-beams, and means for suspending said plates from said upper structure.





62. Graphite crucible. Kozo Nakamura. U. S. 1,466,739, Sept. 4. A crucible having the side walls thereof constructed of a plurality of superimposed substantially V-shaped layers of graphite.

Whiteware

63. Symposium on casting. *Ceramist*, Spring Quarter, 6–27(1923).—Andrew Foltz describes an arrangement for prepg. casting slip and distributing it throughout the shops by means of compressed air. Eric Turner:—Cast saggers cost slightly more than machine or hand made, but they carry a load better. This is attributed to a denser structure which is not disturbed by subsequent repressing. Cast slabs used as targets in oil-fired fur. have the advantages of dense structure and also a thin, but dense surface skin. The grog slip is prepd. in much the same manner as whiteware

slip, excepting that the body is not filter pressed. A mixt. which has given satisfactory service (for saggers?) in general ware and sanitary kilns is as follows:

	Per cent
No. 1 fire clay	25
Plastic fire clay	25
1/4-in. grog	25
1/8-in. grog	25
Water glass	.25 of 1%
Sodium carbonate (crys.)	.20 of 1%

The larger plaster molds used for casting grog bodies should be reinforced on the outside with wood or metal. Wares with max. thickness of 1–1 1/2″ can be cast in the same mold every 6 hrs., while pieces 4 or 5″ thick require 16 to 24 hrs. in the mold. The continuous circulation of hot air around the outside of the mold facilitates the casting operation. 30 slabs measuring 4′ x 3′ x 4′ 1/2″ were cast out of the same mold in as many days. LESLIE BROWN:—For use in the casting of hollow tableware and for a combination of cast and jiggered tableware the materials are first carefully air dried. The body is ground in a ball mill for a definite number of evolutions; the electrolyte is then added and the grinding continued for one hour. The slip is forced by air pressure from the mill through a fine bronze lawn of 200-mesh, passed over electromagnets into agitators and then forced by pumps through galvanized iron pipes for a distance of 500 ft. on the ground floor and then to the 3rd floor of the building where it is used. The dried scrap is weighed, blunged with the necessary amt. of water to which has been added the electrolyte. In ball mill grinding, the wt. of the flint pebbles should be checked very accurately. The actual loss by wt. of a total of 2900 lbs. of pebbles has been found to be 56 lbs. at the end of a 6-day grind. In other instances, the loss averaged 12 lbs. T. A. KLINEFELTER:—The formation of balls or kernels in the ware in casting high tension elec. porcelain is experienced in pieces having a thickness greater than 1″. The use of ht. under the molds to keep them thoroughly dried out during casting was found to be of some assistance in making thick ware. TAINE MCDOUGAL suggested the practice of using a certain propn. of the porcelain body in a calcined ground condition which is being done in the spark plug industry. 45–50% of the body is being calcined to pass 120-mesh. F. W. DINSMORE:—Pieces of elec. porcelain ware 2″ and 2 1/2″ thick are being successfully cast with practically no loss through cracking. These pieces measure from 25″ to 26″ long and 7 1/2″ to 8″ in diameter with corrugations the full length. R. H. MINTON:—Molds used in Germany for casting are constructed with thin walls reinforced with outside straps of iron. C. W. P.

64. The burning of porcelain with fuel oil. A. GRANGER. *Chimie et industrie*, **Special No.,** 330–2(May, 1923).—Operations at the Royal Copenhagen Porcelain Works and at Sèvres have shown that fuel oil can be successfully used and is much more flexible than coal or wood. A. P.-C. (*C. A.*)

65. The re-circulation drier uses little power. H. H. HALLATT. Can. Natl. Clay Prod. Assn., *20th Annual Rept.*, **16**(1922).—The power to operate this drier of nine re-circulating fans, designed by H. of the Tilsbury Brick and Tile Co. (Ontario, Can.), is actually less than 1 h. p. The drier itself is of brick, concrete and steel construction; its capacity is easily a 24-ft. kiln full, or approx. 20,000 4-in. tile per day. H. claims that capacity output on 5 by 8 by 12 in. bldg. tile has been handled by this drier, with practically no waste, and these blocks are the hardest pieces they have. The drier is a 6 track re-circulating waste heat drier and is 63 ft. long and 28 ft. wide. 74 drier cars are used. The drier itself holds 54 cars at one time, 2 shoves are made during the night; the cars are pushed by one man through this short drier without the use of a jacking

app. Re-circulation of drying air is a necessity if the best results are to be obtained. The drying air passing horizontally along the side and top of a tunnel makes the drying of tender clays made into hollow wares and drain tile practically impossible without excessive cracking. By re-circulating the drying air, thus breaking up the hot and cold currents and by forcing the air either up or down through the hollow ware standing on end on the cars, ideal control of the drying and complete saturation of the drying air is possible, which makes possible drying with the utmost economy. This drier is equipped with 9 Ventura fans (48 in.) and 2 exhaust fans. 5 h. p. is actually required to operate all the fans, although the drier motors used have a combined capacity of the 11 h. p. The fans are so arranged that 1 motor or engine would be sufficient. Illus. O. P. R. O.

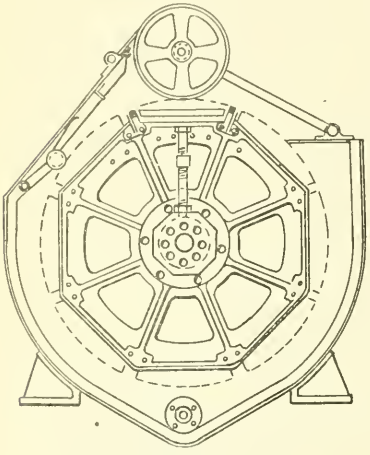


FIG. 1.—Filtering drum.

66. A continuous filter press for ceramic slips. ALIX. CORNILLE. *Rev. Mat. Constr. Trav. Pub.*, **166**, 123–7B(1923). (English translation in *Chem. Age* (London), Supplement, **9**, 9–10(1923). Abstr.)—Description of the Hertenbein continuous filter press (with 7 figures). In a horizontal semi-cylindrical vat, contg. the slip, the filtering drum having an octagonal cross-section is made to rotate about its horizontal axis. Eight boxes having flat bottoms and cylindrical tops are attached to the drum, forming a complete outer cylindrical surface. Each curved segment is perforated and covered with a filter cloth, that is easily replaceable. Two holes in the bottom of each box allow compressed air through one and suction through the other to be applied to the filter cloth. The suction pipe lines lead to the shaft of the filtering drum through one end to a pump, while the compressed air lines lead to the other end of the shaft into a reservoir and then back to the same pump. As a box enters the slip in the vat the openings in the suction line are engaged so as to cause a partial suction in the box, thereby drawing the water through the filter cloth and leaving the concd. ceramic paste on the surface of the cloth, for a rotation of 245 degrees of arc. On leaving the slip the filter cloth with its layer of paste is dried by further suction through 45° of arc. The cycle is completed by having the paste removed by a counterpoised roller touching the filter cloth, with the help of the compressed air which is automatically directed against the filter cloth from the underside. The paste is removed from the roller by a scraper. The box with its filter cloth then again enters the slip. With all 8 filter cloths in position the drum works with $^{11}/_{16}$ of its surface immersed in the slip. Provisions are made for removing the excess water collected, and for regulating the air pressure. A small model with a 12-in. diameter drum was capable of treating 330 lbs. of kaolin per hour. L. N.

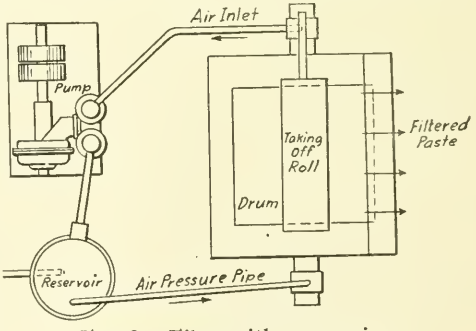
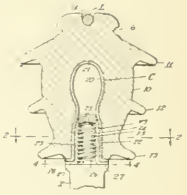
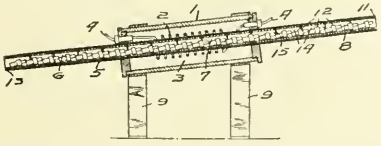


FIG. 2.—Filter with accessories.

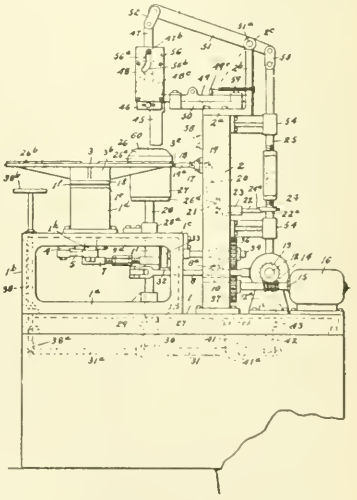
PATENTS

67. Line insulator. LOUIS STEINBERGER. U. S. 1,468,044, Sept. 18. An insulator having a hollow metallic thimble secured thereto and forming a chamber therein, said thimble being provided with an expanded upper portion and longitudinal ribs on its lower portion, said thimble being provided with screw threads and a protecting flange, the inside of said ribs being provided with grooves to form passageways to permit of communication between the interior chamber of said thimble and the atm. when said insulator is mounted upon a supporting pin.



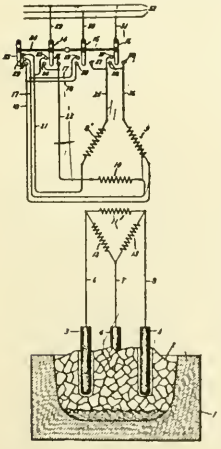


68. Furnace for decorating ceramic ware. JOSEPH A. JEFFERY. U. S. 1,468,947, Sept. 25. In a fur. for progressively heating bodies, a metallic tubular member in which the bodies are placed, a means for heating the tubular member, a porcelaineous lining located in the tubular member for protecting the bodies and the walls of the tubular member.

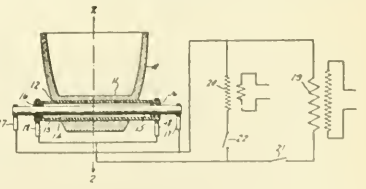


69. Pottery-forming machine. MARTIN BURGER. U. S. 1,469,378, Oct. 2. In a mach. for shaping plastic mat., a support, a plunger, a former tool carried by said plunger, means for actuating said plunger, and means for guiding and moving said plunger and former tool laterally while being actuated by said plunger actuating mechanism.

70. Electric furnace apparatus and method of operating the same. JOHN A. SEEDE. U. S. 1,466,603, Aug. 28. The method of operg. an elec. arc fur. supplied with alternating current which consists in first operg. the fur. with a short arc, thereupon increasing the length of arc while maintaining the current value, and finally reducing the length of arc to operate with a lower energy input.



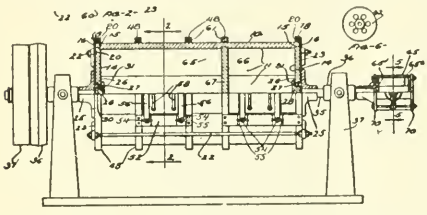
71. Electric furnace. EDWIN F. KIEFER. U. S. 1,467,044, Sept. 4. An elec. fur. of the arc type, comprising a refrac. wall provided with an aperture, and a htg. element insertable in such aperture, said htg. element comprising electrodes in arcing reln. to each other in a closed interspace therebetween.



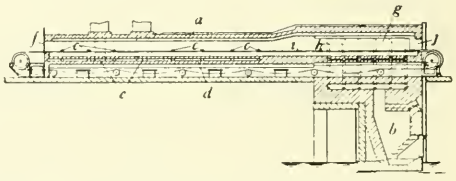
72. Method of and apparatus for drying and conditioning materials. WILLIS H. CARRIER. U. S. 1,467,306, Sept. 11. The herein described method of drying mat. which consists in circulating a body of air through the mat. in a drying chamber, supplying to and mixing with

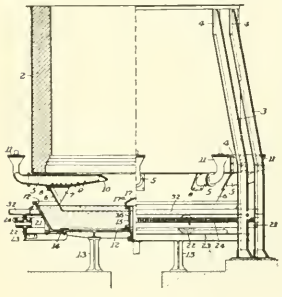
said circulating body of air a relatively much smaller vol. of air, maintaining a predetd. wet bulb temp. of said smaller vol. of supplied air previous to its supply to the chamber by mixing fresh air and return air from the drying chamber and regulating its humidity under the control of the wet bulb.

73. Pulverizing mill. FRANKLIN H. WOLEVER. U. S. 1,468,893, Sept. 25. A mill for pulverizing enamel stock and the like comprising a rotative barrel formed with end walls and a circumferential wall of internal polygonal cross-section, with the segments meeting at angles of from 90 to 135°, all made of vitreous porcelain, the circumferential wall being continuous from end to end and joined to the end wall by internal dry joints, said circumferential wall being made of solid vitreous porcelain staves and being joined along integral beveled edges by internal dry joints to produce the angle specified and means exterior to the internal faces of the joints between the beveled edges of said staves and between the end walls to hold the barrel members rigidly together.



74. Furnace. THEODOR TEISEN. U. S. 1,469,461, Oct. 2. In fur. kilns or leers, the combination comprising a long horizontal cooling chamber through which are conveyed the articles to be treated, a collecting flue located beneath the floor of the chamber, a plurality of passages arranged at intervals in the side walls of the said chamber with their inlet ends at a distance above the floor of the chamber and located between the chamber and collecting flue, and a branch outlet flue for discharging hot gases from the collecting flue, substantially as described.





75. Gas producer. FRANCIS H. TREAT. U. S. 1,469,399, Oct. 2. In a gas producer, a stationary ash pan, a trough surrounding said ash pan, and means for elevating ashes over the peripheral edge of said ash pan and delivering the same to said trough, substantially as described.

Geology

76. Kaolin. ANON. Rept. on Mining Operations in the Province of Quebec during the Year 1922. p. 81–90.—After a period of quiescence, work has been resumed on the china clay deposits of Amherst township and has been pushed actively throughout the year of 1922. The shipments of kaolin during that year amounted to 1296 T. valued at $18,532, of which 1196 tons were washed white china clay, and 100 T. were stained kaolin used as fire clay. The report also contains a summary of the history of these kaolin deposits dealing with origin, distribution, character, composition and development.

O. P. R. O.

77. China clay deposits in Malay. W. R. JONES. *Chem. Age, China Clay Trade Rev.*, Sec. v, **9**, 16 (1923).—Extensive china clay deposits were recently discovered not far from the famous tin mining center of Ipoh, Malay. Exhaustive investigations were immediately carried out to ascertain the exact amt. of raw mat. available before

a pottery was started. These were found to be enormous and the manuf. of pottery has now passed the exptl. stage. O. P. R. O.

Chemistry and Physics

78. The estimation of hydrogen in producer gas. WILHELM. *Feuerungstechnik*, **11**, 171–2(1923).—An indicating and recording device for the continuous detn. of H_2 in producer gas is described. It depends on the very high heat cond. of H_2 compared to the other constituents, which have nearly equal conds. Two fine Pt wires are stretched axially in holes bored in a metal block. The sample of producer gas, cleaned and freed from H_2S by $CuSO_4$, is passed through one hole; air is sealed in the other. A fixed heating current is passed through the two wires, which form two arms of a bridge. A galvanometer gives readings in % H_2 directly. The zero point of the instrument is set to allow for the known effect of CO_2 and CH_4. The instrument is in successful operation, the accuracy being better than 0.5%. ERNEST W. THIELE

79. Analysis of silicates. RUDOLPH BARTA. *Rev. Mat. Constr. Trav. Pub.*, **166**, 156(1923).—In analyzing silicates, decomposable by acids, especially cements, it has been found difficult to filter and separate the silicic acid. Jaroslav Mateyka has traced it to the influence of the chloride $SiCl_2$, $CaCl_2$, in the presence of meta titanic acid. This may be remedied by the addition of ammonium chloride. L. N.

80. The problem of the combination of water in zeolites. O. WEIGEL. *Centr. Min. Geol.*, **1922**, 164–78, 201–8; *Chem. Zentr.*, **1922**, III, 702–3.—The close agreement of the exptl. results of W. (cf. *Sitzungsber. Ges. Beförderung gesamten Naturwiss. Marburg*, **1919**, no. 5; *Chem. Zentr.*, **1920**, I, 242) with those of Scheumann (cf. *C. A.*, **15**, 3804) is emphasized, but it is not considered that the break in the dehydration curve at the 0.5 mol. value for the heulandite reported by Scheumann is exptly. verified. Both investigations show that heulandite contains no H_2O combined such as that in ordinary hydrated salts, but at the best is a special kind of solid soln. which as a result of the directing forces of the relatively rigid silicate lattice on the easily mobile H_2O component shows an analogy to true hydrates. Contrary to Beutell (cf. *C. A.*, **17**, 515) it is maintained that (1) the practically complete reversibility of hydration and dehydration at temps. below 180° are proved exptly. and also that Scheumann has shown that (1) no permanent change is caused by dehydration up to a H_2O content of 3 mols.; (2) contrary to Beutell the curve at low temps. shows almost complete continuity; (3) the breaks in the curve would not appear at higher temps. with integral mols. if any considerable decompn. actually occurred; (4) the curves of Scheumann and W. conform to one another closely up to 200° though the preliminary treatment of the material was different in each case; (5) no evidence was found by optical expts. of decompn.; and (6) Stoklossa observed by optical means no decompn. of the mol. when dehydrated to 2.5% H_2O. Beutell has not proved his assertion that zeolites contain H_2O combined in a manner similar to hydrated salts. C. C. D. (*C. A.*)

81. Colloidal clay. D. CASIMIRO BURGUÉS Y ESCUDER. *Mem. acad. cienc. artes*, **17**, No. 19, 18 pp.(1922).—Ten-g. portions of air-dried, 1 mm.-mesh clay were shaken with 200 cc. 1:1000 soln. of different dyes, and the amt. of unadsorbed dye remaining in each soln. was detd. colorimetrically. Following is the vol. of 1:1000 dye soln. which, if dild. to 50 cc., would match the color of the soln. of unadsorbed dye: "Crystal violet O," 4 cc.; "concd. acid green," 10 cc.; "dianiline red," 10 cc. "Methylene blue DBB" was almost completely adsorbed, and "fuchsin in large crystals" even more so. If 5-g. portions of clay were used, 7 cc. and 2 cc., resp., of methylene blue and fuchsin, when dild. to 50 cc., matched the colors of the unadsorbed dyes. The presence of $CaCO_3$ in the clay did not alter its power to adsorb methylene blue. Other expts., not detailed, indicate that the amt. of dye adsorbed by a clay is not a satisfactory quant. measure of

the colloidal matter in the clay, because other components of the clay may also adsorb dye. This paper is largely a résumé of the work of others. R. H. I. (*C. A.*)

PATENTS

82. Decomposition by acids of siliceous alumina compounds. Aktieselskapet Hoyangfaldene, Norsk Aluminium Co. Norw. 35,193, July 3, 1922. Clay is treated with H_2SO_4 in a rotary drum coated with acid-resisting material. The acid is applied dropwise in amts. somewhat insufficient for complete decompn. Practice shows that Al_2O_3 is still completely liberated. Heat is produced by the reaction. Accordingly the mass is passed through a heated drum where the temp. is kept above 140° but not so high that decompn. of Al sulfate takes place. By the following extn. Al sulfate (and Fe sulfate) is obtained in the soln. and the remaining undissolved SiO_2 is easy to filter.

General

83. Stain and efflorescence on ceramic products. F. Bigot. *Rev. Mat. Constr. Trav. Pub.*, **166**, 121–2B(1923).—*Green stain or efflorescence* has been noted to appear on clay bodies heavily charged with mica. A kieselguhr contg. a notable quantity of manganese showed a similar efflorescence on exposure to humidity. A stoneware clay to which had been added 2–3% chromite and burned to 1200° in an oxidizing fire, developed a green efflorescence on exposure to dampness. Calcareous white bodies used for faience, covered with a heavy lead glaze, often show a yellow coloration in the glaze characteristic of lead and chromium—such colorations not being observed in opaque tin glazes. Green stains are produced on clays contg. alkalies, the alk. earths even in large proportions not preventing the formation of sol. salts. Firing with coal containing sulphur seems to aid the formation of such stains. *Lead glazes vs. leadless glazes.* In the manuf. of faience tableware, a yellow stain is often prominent on large pieces requiring time for drying after dipping in a lead glaze, the pieces most often being worthless after firing. However with a leadless, boric acid glaze, no colorations are noticeable. The industry has the choice of eliminating the undesirable colorations by (1) biscuiting the body to a temp. high enough to dissociate completely the complex compds. of lime, silica, carbonic and sulphuric acids (about 1000°), and then using a lead glaze, or (2) by using leadless glazes (boric acid) instead, with the usual biscuit burn. *Grey colorations.* A dull grey coloration visible through a transparent glaze was traced to the presence of calcium sulphide contained in the plaster of Paris used as a mold. The impurity was introduced by the reduction of the gypsum in the hot part of the kettle fired with lignite which gives a long flame. Exposing the clay products having the grey coloration to sunlight restores them to their original whiteness in a few days, whereas exposing them in a humid unlighted place required many months for the same result. L. N.

84. The use of fuel oil in the clay industry. Anon. *Brit. Clayworker*, **32**, 166–8 (1923).—Fuel oil is a well defined product of the distillation of petroleum the lighter oils having been removed. This viscous oil has certain well defined phys. and chem. properties. At 60°F the sp. gr. = 0.95; the flash point is above 150°F; the S in it is about 3.5%; the calorific value is about 18,750 B.t.u. Its flame temp. is high and is above that required in any operation connected with clay working. Hitherto, brick burning with oil has not been successful and has not been studied technically in a systematic way. The reason for this is that the types of burners used until recently have not proved satisfactory. Further expts. in the use of oil for burning brick may be successful. For drying china clay it has recently been found very satisfactory. The cost of drying clay was reduced in one case from 8s. 6d. to 7s. 9d. per ton of clay by using oil firing instead of coal. H. G. S.

85. Saving coal in ceramic plants. BASCHANT. *Deut. Töp. Zieg. Ztg.*, **54**, 239–40, 247–48(1923).—In firing boilers the grate area should be ample so that rushing the fire will be unnecessary. If the grate bars are set high the fresh air will prevent the bars from becoming overheated. Coals producing a large amt. of soot should be avoided since the soot becomes caked on the pipe acting as an insulator. In some cases it is more economical to use coals with a low B.t.u. value. With boilers in which a low temp. must be maintained coals having a low B.t.u. value are most economical and produce a more uniform ht. A boiler scale 1 mm. thick will increase the fuel consumption 5%. To distil impure water, the hot steam may be led through tanks and thus preheat this water. When possible soft water should be employed for boilers. After installing a water purifying equipment in a plant it was not necessary to clean the boilers so often. This equipment consisted of one 3 m. high cylinder and one 1 m. high. The water was pumped into the 1 m. cylinder through a sand filter into the 3 m. cylinder then heated to 50–60°C by means of exhaust steam coils, which caused the sediment to settle. For well water the amt. of $CaCO_3$ and $CaSO_4.2H_2O$ should be detd. and the corresponding amt. of Na_2CO_3 or scale preventor should be added. When using impure water it is good practice to fill up the boiler above the water line every night. Before firing the boiler the next morning, drain the boiler to the water line and it will be found that a large amt. of sediment will be removed. If the plant is shut down in the fall, clean the boilers by applying a mixt. of 3 parts wood tar and 1 part graphite to the interior of the pipe and remove by means of a boiler brush. A common mistake is to fire boilers to produce a min. pressure. A boiler producing a pressure of 10 atmos. requires a temp. of 183.1°C and consumes 667.1 cal. of ht. The same boiler operated at 6 atmos. requires 164.6°C and consumes 662 cal. About 62.95% coal is actually utilized in htg. up the water, 22.1% is lost in waste gases, 7.47% is lost in unburned coal in the ashes and in cinders and 7.57% is lost by conduction. H. G. S.

86. Ceramic ware for machines. F. SINGER. *Zeit. Verein. Deut. Ingenieure*, **24** (1923); *Tonind. Ztg.*, **47**, 537(1923).—S. calls attention to the fact that certain ceramic products can be used to replace many cast iron parts on machines now being used in the shops of various manuf. plants. H. G. S.

87. Ceramic work. W. G. WORCESTER. Can. Natl. Clay Prod. Assn., *20th Ann. Rept.*, **7** (1922).—Ceram. work has been undertaken by the Sask. Govt., because it has long been recognized that the province is preëminent as to its raw mat. for the production of brick and pottery. A dept. of ceram. has been established in the University of Sask., with a very complete ceram. lab. for the testing of all grades of clay. A Clay Products Intelligence Bureau has been formed, and Sask. brick, tile, pottery and raw clay have been exhibited at her largest cities. A careful and systematic survey of the more outstanding undeveloped clay deposits is under way. Up to the present there have been tested fire clays, china clays, including the ball and stoneware clays, terra-cotta clays, paving brick, buff and red face brick clays, numerous clays for the manuf. of the more common lines of clay products and clay for paint and paper manuf. O. P. R. O.

88. Education—old style. EDITORIAL. *Nat. Resources*, **1** [1], 2(1923).—Importance is emphasized of recent expts. by the U. S. Bur. Mines in coöperation with the Central of Ga. Ry. in the ceram. interests of Ga. ED.

89. The lime, cement, ceramic and glass laboratory of the Conservatoire National des Arts et Métiers, Paris. ANON. *Recherches et inventions*, **4**, 690–6(1923).—Description of the equipment. A. P.-C. (*C. A.*)

PATENTS

90. Heat-insulating material and method of manufacture. OSCAR GERLACH. U. S. 1,468,149, Sept. 18. A method of preparing a lt. insulating compn. including

adding a sol. metallic salt to a soln. of a silicate, sepg. the gelatinous ppt. so formed from the salts in soln., and mixing the sepd. ppt. while it is still moist with infusorial earth.

91. Elutriation of clay and kaolin. B. SCHWERIN. Can. 233,737, Aug. 21, 1923. The clay is put into suspension and brought to the sol. condition by the addition of a suitable electrolyte, it is then allowed to settle. (*C. A.*)

AUTHOR INDEX TO ABSTRACTS

The reference number in parenthesis refers to the *monthly* number of *Ceramic Abstracts;* the number following this is the *page* number. The letter A, B or P preceding reference number indicates that the abstract is Abstract (A), Book (B) or Patent (P).

VOLUME 2

A. P. Carbon brick, A (2) 17.
Ackermann, A. S. E. Phys. properties of clay, A (5) 110.
Adams, F. W. Manuf. of colorless glass in a tank fur., A (10) 218; Manuf. of white flint glass in a tank fur., A (6) 124.
Adams, I. E. Burnt lime or limestone in glass batches, A (5) 95; From manganese to selenium, A (5) 96.
Adamson, J. Frequency of charging batch into fur., A (2) 26.
Addenbrooke, G. L. Elec. properties of flint glass of d. 6.01, A (9) 195.
Adler, H. Process for removing enamel from old and new enameled articles, P (12) 274.
Akatsuka, M. Expts. on the manuf. of pure-white hard porcelain, A (7) 163; Uraninm glazes, A (7) 142.
Allen, A. W. Artificial pebbles for tube milling, A (2) 6.
Allen, D. E. See Hartman, M. L.
Allen H. E. Leer conveyor for sheet glass, P (8) 179.
Allen, T. B. Process of mfg. aluminous abrasives, P (8) 172.
Allison, L. R. W. Annual meeting of N. J. Clay Workers' Assn. and East. Section of Amer. Ceram. Soc., A (5) 115.
Alter, H. F. See Moore, W. E.
Amenomiya, Y. Devitrification caused upon the surface of sheet glass by ht., A (6) 124.
Amsler, W. O. Annealing fur. or leer, P (7) 153; Modern annealing cycle, A (5) 96.
Andersen, O. Phys. chemistry of refrac. oxides, A (9) 199; Quartz (Norway), A (6) 128; See Holtedahl, O.
Anderson, H. F. Method and mach. for constructing embossed glass plate, P (11) 248.
Anderson, R. P. Tables and charts for natural gas users, A (2) 5.
Anfindsen, C. B. Kickback car dump, P (7) 159.
Anspach, M. Glass tile for covering walls, P (8) 176.
Anthes, G. P. See Slater, W. A.
Anthony, A. R. Burner, P (9) 202.
Antonoff, G. N. Surface tension in solids, A (5) 111.
Appert, L. Progress in glass indus., A (9) 195.
Arnold, V. Continuous updraft vertical shaft lime kiln, P (6) 121.
Asahara, G. Nature of graphite and amorphous carbon, A (5) 99.
Asquith, M Causes of secondary boil, A (2) 27.
Atkins, F. J. Oil burner, P (9) 202.
Atkinson, J. S. Recent developments of powdered-coal firing, A (5) 116.
Austin, A. O. Joint for articles of ceram. and similar mat. and method of producing same, P (4) 77; P (9) 200.
Ayres, E. B. App. for drying thin plates or other clay articles, P (3) 48.
Bagge, P. F. Rumanian cement mill, A (3) 66.
Bailey, C. F. Kiln for firing pottery and other articles, P (4) 81; P (11) 262.
Baillie, W. L. Examn. and extension of Zulkowski's theory of reln. between the compn. and durability of glasses, A (3) 61; Some aspects of the autoclave test for durability of glass, A (12) 276; Use of autoclave method in testing glassware, A (5) 92.
Baillie and Wilson. Autoclave test for chem. glassware, A (2) 27.
Bain, G. W. Magnesite deposits of Grenville, Quebec, A (9) 209.
Ballo, R., and Jugovics, L. Theory of formation of dolomite, A (3) 50.
Bancroft, W. D. Prob. of retarding corrosion, A (4) 82.
Barbean, H. M. Glass-grinding mach., P (4) 73.
Barringer, L. E. Elec. insulating compn., P (3) 47.
Barta, R. Anal. of silicates, A (12) 280; Brick-making in Czechoslovakia, A (9) 196; Building mat. indus. in Czechoslovakia, A (12) 287.
Barton, L. E., and Kinzie, C. J. Method of sepg. zircon from undesired subs., P (8) 189.
Baschant. Saving coal in ceram. plants, A (12) 289.
Bassett, H. P. See Meigs, C. C.
Bawtree, A. E. Record of color research during 1922, A (11) 236.
Bayley, W. S. See Ries, H.
Beebe, D. S. Tool for cutting glass while in plastic state, P (10) 219.
Beebe, R. See Menzies, A. W. C.
Beecher, M. F. Bonded alumina refrac. mat., P (6) 132; Safety-tread tile, P (6) 120.
Beecher, M. F., and Booze, M. C. Bonding carbide grains with ceram. mat., P (6) 131; Laminated super-refrac. article, P (8) 183.
Beecher, M. F. See Klein, A. A.; See Jeppson, G. N.
Bell, H. Forms of specif. for purchasing coal, A (6) 139.
Bell, H. A. New form of m. p. app., A (7) 165.
Bell, M. L. See Nesbit, C. E.
Bell, W. J. Sifting testing mach., P (8) 185.
Belvoir, T. See Kelly, C.
Benedicks, C., and Sörberg, E. Improvement of emery papers, A (5) 90.
Benfey, G. Manuf. of clay products in Ger., A (7) 157.
Bentz, H. App. for drying mats. by steam and air currents, P (6) 136.
Bergdahl, B. The new precision pycnometer, A (11) 260.
Berglund, A. Cement mill, P (4) 78.
Berl, E., and Urban, W. Hydraulic binding mats., A (10) 215.
Berninghaus, E. Method of enameling, P (7) 149.

Berry, H. Artificial stone, cements, etc., P (11) 240.
Bertrand, L. Ceram. products: degree of firing ascertained by microscope, A (9) 210; Influence of hardening of cement and lime mortars in steam under press. on mech. strength of these mortars, A (4) 71; Use of petrographic microscope in ceram. to exam. structure of clay in raw and fired state, A (10) 221.
Bied, J. Aluminous cement, A (5) 91; Utilization of the waste ht. of rotary cement kilns, A (3) 66.
Biehl, K. See Grün, R.
Bigelow, F. B. Fur. sectional dead grate with brick inserts, P (10) 228.
Bigot, A. The basic glasses industry, A (11) 246; Losses on ignition and porosity of kaolin, clays, bauxites, etc., A (4) 83; Plasticity of ceram. mat., A (9) 210.
Bigot, F. Stain and efflorescence on ceram. products, A (12) 288.
Bingham, E. C., Bruce, H. D., and Wolbach, M. O., Jr. The plastometer as an instrument for process control, A (3) 50.
Binns, C. F. Brick or tile for fur. construction, P (9) 209.
Bird, C. A. Elec. fur. melting, A (3) 52.
Bitting, A. W. Study of brown glass milk bottles, A (3) 59.
Black, J. H. Manual of face brick construction, B (7) 159.
Blacker, J. F. The A. B. C. of English salt-glaze stoneware, from Dwight to Doulton, B (11) 259.
Blakeslee, H J. Pyrometer of potentiometer type, P (6) 136.
Blixt, T. See Frozeth, E. E.
Blizard, J. See Kreisinger, H.
Block, B. The sieve centrifugal, A (3) 48.
Blum, D. See Kissner, H.
Boiboul, M. Crucibles, P (3) 53.
Bone, W. A. Surface combustion with special ref. to recent developments in radiophragm htg., A (9) 208.
Bonnet, F. Compressibility of matter. Method and app. (patented) for measuring press. exerted in press, A (7) 165.
Booze, M. C. Nonslip quartz tile, P (8) 172; See Beecher, M. F.
Boss, J. C. App. for drying brick and other clay articles, P (12) 281.
Boswell, P. G. H. Comparison of Brit. and Amer. foundry practice, B (5) 10; Glass-making sands (W. Australia), A (7) 169.
Bowles, O. An untrodden field in lime research, A (11) 239.
Boudouard, O., and Lefranc, J. Quant. anal. of clays, A (5) 110; Studies of clays. II. Centesimal and rational anal., use of microscope, A (8) 188.
Bowen, N. L. See Morey, G. W.
Bowley, H. Chemistry of alunite, A (2) 12.
Brace, P. H. Terminal for elec. fur., P (9) 203.
Bradley, W. E. F. Elec. fur. for ore reduction, P (2) 20.
Brain, G. See Kirk, C. J.
Braun, W. Problems in geol. of service to ceram., A (11) 263.
Brender à Brandis, G. A. Sp. ht. gases, A (2) 14.
Brenner, A. See Schwartz, R.
Brenner, R. F. Manuf. and properties of oven glass, A (5) 95.
Brissaud, A. A new application of the elec. fur. Fused aluminous cement, A (11) 239.
Brit. Port. Cement Research Assn. Setting of Port. cement, A (7) 146.
British Thomson-Houston Co., Ltd. Glass, P (11) 250; Porcelain, P (3) 51.
Brobston, J. Utilization of waste ht. from rotary cement kilns, A (2) 36.
Brookes, E. Mach. for use in the manuf. of teacups, breakfast cups, beakers, and other vessels or articles of pottery, P (11) 259.
Brooks, F. W. Methods of handling mats. in elec. fur. and the best type of fur. to use, A (7) 166.
Brown, A. E. Brick roads for Britain, A (6) 127.
Brown, F. H. Burner, P (9) 209.
Brown, G. H. Burning of porcelain, A (4) 76.
Brown, J. C. Mineral colors, A (2) 11; Corundum in India, A (2) 21.
Brown, L. Symposium on casting, A (12) 282.
Brown, S. N. Setting and hardening of cements, A (10) 214.
Brown, W. D. R., and Pickston, W. T. Gas-analyzing app., P (3) 49.
Browne, C. A. Early chem. indus. in Amer. (A few comparisons of past and present conditions), A (2) 7.
Bruce, H. D. See Bingham, E. C.
Brumbaugh, J. D. Electrolytes' effect on plastic clay, A (5) 108.
Bryden, C. L. Development of the filter press, A (4) 77.
Buckley, L. C. App. for shaping insulators, P (11) 259.
Buckman, H. H., and Pritchard, G. A. Refrac. articles contg. zircon, P (6) 132.
Budnikov, P. P. Gilding glazed clay vessels, A (8) 174; Zircon for white glazes, A (7) 142.
Budnikov, P. P., and Syrkin, J. K. Dissocn. of calcium sulfate at higher temp., A (8) 188; Hardening and speed of soln. of calcined gypsum, A (8) 189; Setting and velocity of soln. of burnt gypsum, A (6) 121.
Building Code Committee. Recommended minimum requirements for small dwelling construction, A (4) 74.
Bundrick, D. D. Thermometer support for use in kilns, P (2) 10.
Burchartz, H. Clay and cement tubing, A (5) 98; Ht.-insulating power of structural mat., A (11) 254; Properties of Port. cement, A (11) 239.
Burger, M. Pottery-forming mach., P (12) 265.
Burgoon, C. E. Ht. efficiency increase in cement burning, A (2) 35.
Burgues y Escuder, D. C. Colloidal clay, A (12) 287.
Burns, R. M., and Hulett, G. A. Some properties of graphite, A (7) 161.
Busard, I. B. Sheet-glass-drawing and delivering app., P (12) 278.
Butterworth, F. W. Method of forming texture brick, P (10) 223; Sanded texture brick, P (10) 223.
Buttolph, L. J. A small high intensity mercury arc in quartz glass, A (5) 114.

Cadwell, C. A. Elec. fur., P (11) 261.
Cadwell, S. M. Acceleration of vulcanization and products obtained thereby, P (10) 230.
Call, B. G. Rabble-fur. construction, P (11) 260.
Cambage, R. H. Clays, A (10) 229.
Caffrey, J. H. Fibrous wall-board, P (7) 149.

Cahill, W. E. Melts gray iron elec., A (4) 79.
Callard, R. P. Sheet-glass-drawing mechanism, P (12) 278; Drawing continuous sheet glass, P (12) 278.
Campbell, A. M. Feldspar, A (4) 81.
Candlot, E. Automatic vertical fur. for baking of cement, A (4) 70.
Capp, J. A. Suggested methods for verification of testing mach., A (5) 105.
Carpenter, C. H. Elec. fur., P (9) 203; Elec. resist. crucible fur., P (6) 135.
Carrier, W. Method of and app. for drying and conditioning mats, P (12) 285.
Carruthers, J. L. Notes on shivering of terra cotta, A (2) 21.
Carruthers, R. G., and Pocock, R. W. Fluorspar, A (4) 81.
Carter, S. A. Chem. deposition of silver on mirrors, A (5) 93.
Cassidy, P. R. Fur., P (8) 182.
Castelli, G. Practical procedure for anal. of bauxite, A (9) 211.
Catlett, C. Oxychloride cement, P (3) 67.
Chapman, W. B. Gas-producer ht. balances, A (11) 246.
Charriou. Ferric oxide and alumina sepd. from lime, A (5) 109.
Chatley, H. Clay-mud, A (5) 109.
Chatterton, R. M. Clean producer gas, A (10) 228.
Chaudron, G., and Garvin, M. Lab. app. for htg. at high temp., A (9) 202.
Chéine, S. D. Manuf. of aluminium in Russia, A (5) 90.
Christie, C. H. Door for glass-pot fur., P (12) 279.
Chubb, L. W. App. for elec. pptn. of suspended particles from gases, P (4) 78.
Cite, J. D. See McElroy, R. H.
Clamer, G. H., and Wyatt, J. R. Elec. inductive fur., P (6) 135.
Clapp, H. B. Refrac. mat. for high-temp. app., P (6) 132; See Ferolite, Ltd.
Clark, F. G. Dark spots on chromium green glass, A (2) 27.
Clark, W. G. Feed trough for glass fur., P (10) 220.
Clark, W. M. Opportunity for an Amer. glass training school, A (7) 153.
Clarke, J. R. Fluorescence and coloration of glass produced by β-rays, A (8) 176.
Clements, F. Brit. Siemans fur. practice, A (2) 16.
Clements, J. M. Cement indus. in China, A (2) 35.
Clerc, C. See Nihoul, A.
Cochran, A. B. Making stiff mud fire brick, A (10) 223.
Colby, O. A. Elec. resist. fur., P (4) 81; Elec.-fur. resistor, P (9) 206.
Cole, A. J. G. Rocks and their origin, B (5) 108.
Cole, L. H. Diatomaceous earth, A (10) 230; Silica, A (10) 230.
Collings, W. R. See Cottringer, P.
Collins, E. F. Elec. ht., its generation, propagation and application to indus. processes, A (3) 46; Mats. for fur. and ovens, A (3) 51; Notes on reheating of glass electrically, A (7) 153.
Collins, H. F. China clay. Its compn., prepn. and uses, A (7) 169.
Collins, H. R. Separator, P (9) 206.
Cone, E., and Hale, J. W. Refrac. fur. linings, P (12) 282.
Coon, J. M. Microscopical examn. of China clay, A (10) 226.
Cooper, R. B. Brick, P (8) 189.
Cordenot, L. A. Ceram. compns., P (3) 55.
Cordery, F. Manuf. of bldg. blocks and bricks, P (11) 240.
Corl, R. M. Process of and app. for forming glass, P (11) 249.
Cornille, A. A continuous filter press for ceram. slips, A (12) 284.
Corning Glass Works. Glass, P (7) 155; Glass manuf., P (12) 280.
Corse, W. M. Federal and state research agencies, A (3) 46.
Cottringer, P., and Collings, W. R. Method of making anhydrous magnesium chloride, P (9) 206.
Couëtoux, H. Mech. burning of brick and tile, A (7) 166.
Cousen, A., and Turner, W. E. S. Production of colorless glass in tank fur., with particular reference to the use of selenium, I, A (5) 94.
Cousen, A. See Turner, W. E. S.
Cox, S. F. Application of calorizing to glass-making process, A (5) 96.
Craig, E. N. See Pearson, R. E.
Craven, M. B. Note on cause of "splitting" of a pottery body, A (3) 54.
Creighton, H. J. M. Method of calcg. fluidity, surface tension, and reaction (equilibrium) press., A (4) 83.
Cressy, E. Discoveries of the Twentieth Century, B (5) 117.
Crossley, P. B. Non-fragile glass, P (3) 63.
Crowley, J. P. App. for and method of drawing sheet glass, P (4) 73; Method of an app. for producing continuous sheet glass; P (12) 279; Method of making sheet glass, P (12) 279.
Crowley, J. P., and Rowley, C. A. App. for bending continuous-sheet glass, P (7) 155.
Crupi, F. J. Method of making abrasive articles of manuf. and product, P (12) 272.
Currie, J. Columnar structure in sandstone tank blocks after rapid htg. and cooling, A (5) 94; A (10) 218.

Daae, R. Gas producer, P (7) 168.
D'Adrian, A. L. D. Fused zirconium oxide articles, P (3) 53; Glass, P (3) 64.
Danehower, F. B. Refrac. article and method of making same, P (8) 182.
Darby, E. H. See Kraus, C. A.
Darling, C. R. Elec. resist. fur., A (6) 137.
Davenport, R. W. Rapid decorating firing fur. or kiln, P (8) 185.
Davidson, F. "Davon" micro-telescope and supermicroscope, A (5) 105.
Davidson, J. H. Dark spots on chromium green glass, A (2) 27.
Davidson, S. Method of and app. for feeding molten glass, P (10) 221.
Davis, C. A. Manuf. of Port. cement, B (5) 91.
Davis, H. E. Something better in enamel smelters, A (3) 64.
Day, D. T. App. for combined solvent and destructive distillation treatment of shale, P (8) 191.
Dede, L. Comment on R. Fricke's communication, "Rubbing the wall of a glass vessel with glass rod," A (2) 28.

Deguide, C. Process for the manuf. of alkali-metal silicates, P (11) 265.
Delany, J. H. Manuf. of ht.-insulating articles, P (11) 249.
Delorme, F. Automatic feeding of fuel in Hoffmann continuous kilns, A (7) 166.
De Luca, D. Tilting elec. fur. adapted for melting scrap iron, P (6) 135.
De Mejer, E. C. Prevention of efflorescence on bricks, etc., P (3) 57.
Demougeot, M. A. Manuf. of articles of glass, P (11) 249.
Demorest, D. J. Gasification of Ohio coals, A (5) 116.
Denaeyer, M. E. Chem. constitution of feldspars. Anal. of 2 microclines, A (2) 12.
Denk, F. J. Ht. balance for 25-T. glass tank, A (3) 59.
Denney, G. C. Arch brick, P (11) 257.
Deputy, F. E. Leer conveyor for continuous sheet glass, P (7) 155.
Derby, I. H., and Higburg, W. Pure cresol from crude tar acids, P (7) 168.
Desch, C. H. Colloidal systems in solid cryst. media, A (5) 114.
Desenberg, J. Process of mfg. optical glass, A (6) 123.
Desgraz, A. Charac. for evaluation of limestone, dolomite and similar carbonate rocks and rapid method for analyzing the same, A (5) 91.
Deulin, F. E. Leer conveyor for continuous-sheet glass, P (7) 155.
Devereux, P. S. Refractories, A (4) 76.
Dickenson, A. W., Dimbleby, V., Norton, L. E. and Turner, W. E. S. Mixing of glass batches in factories, A (10) 219.
Dickenson, A. W. See Turner, W. E. S.
Dimbleby, V. M., Hodkin, T. W., Parkin, M., and Turner, W. E. S. A study of the melting and working properties of boric-oxide glasses with ref. to the boro-silicates, A (12) 275.
Dimbleby, V., Muirhead, E. M. M., and Turner, W. E. S. Effect of magnesia on resist. of glass to corroding agents and comparison of durability of lime and magnesia glasses, A (3) 61.
Dimbleby, V. M., and Turner, W. E. S. The anal. of glasses rich in boric oxide, A (12) 275.
Dimbleby, V. See Turner, W. E. S.
Dingledine, H. F. Construction and adjustment of dies, A (9) 195.
Dinsmore, F. W. Symposium on casting, A (12) 282.
Dorello, P. New thermo-regulator for the thermostat, A (2) 8.
Drake, J. W. Vertical gas retort and producers, P (6) 139.
Drever, H. Elec. steam generator, A (5) 115.
Driscoll, R. A. Elec. fur., P (6) 136.
Drouot, H. Refrac. mats., A (7) 161.
Duckham, A. M. Gas-fired pottery kiln. P (3) 53; Muffle fur., P (6) 137; Some new forms of kilns A (3) 45.
Dümmler, K. Tunnel kilns, A (7) 166.
Dundon, M. L. Glass-metal joint, A (6) 125.
Dupuy, M. E. L. Properties of refrac. under load at high temps., A (2) 16.
Durante, G. App. for photomicrography, A (7) 165.
Durbin, P. C. Cement kiln insulation, A (5) 101.
Dworzak, A. Rotary horizontal fur. or kiln adapted for htg. granular or pulverulent mat., P (6) 137.
Dyer, R. J. Kiln, P (7) 167.
Dyrssen, W. App. for moving fur. electrodes, P (9) 206.

Eckel, E. C. Cements, limes and plasters, B (5) 92.
Eckert, F. Annealing of glass, A (10) 217. Hollow wall, P (9) 197.
Eckley, J. R. See Moore, W. E.
Edmonds, W. G. Operating continuous glass fur. with fuel oil, A (5) 95; Use of fuel oil for finishing glassware, A (5) 95.
Edwards, V. C. Reinforced glass, P (12) 277.
Eichenberger, F. Elec. resist. mat., P (3) 53.
Eisenmann, J. Building block and construction, P (9) 197.
Ellenwood, J. W. Grading app., P (8) 190.
Elliott, C. Plaster of Paris tech., A (11) 236.
Ells, S. C. Bituminous sands (Alberta), A (5) 106.
Elsenbast, A. S., and Jordan, W. L. Insulating cement, P (3) 53.
Elwood, H. Crazing of Eng. earthenware, A (6) 133.
Elworthy, R. T. Fossil resin from Brit. Columbia, A (5) 106.
Emerson, J. W. Hardened water-repellent gypsum plaster and method for producing same, P (12) 274; Plaster wall board, P (6) 122.
Emery, W. See Jones, D.
Endell, K. Importance of sci. research in development of ceram. indus. in N. A., A (2) 5.
English, S. The effect of various constituents on the viscosity of glass near its annealing temp., A (12) 276; An examn. of some current views on the detection of strain in glass, A (12) 276.
English, S., and Turner, W. E. S. D. of soda-lime-magnesia glasses and calcn. of d., A (10) 219; The influence of boric oxide on the annealing temp. of boro-silicate glasses, A (12) 275.
Ennos, F. R., and Sutcliffe, R. Estimation of iron in ores and silicate rocks, A (11) 268.
Erckmann, P. E. Pyrex glass, A (4) 73.
Eskola, P. Silicates of strontium and barium, A (4) 83.
Evans, E. The trend in modern Amer. ceram., A (12) 272.

Fabre, J. H. The Wonder Book of Chemistry, B (5) 117.
Fahrenwald, A. W. Film method for measuring surface and interfacial tension, A (5) 112.
Farish, W. A. Non-recrystd. refrac. mat., P (10) 226.
Farmer, F. M. Rept. of Comm. D-9 on elec. insulating mats., A (5) 104.
Feldenheimer, W., and Plowman, W. W. Treating clay, P (3) 51; Treatment of clay, P (6) 138; P (8) 190.
Feldman, A. See Harkins, W. D.
Ferguson, J. B. See Williams, G. A.
Ferngren, E. T., and Soubier, L. D. Glass-cutting mechanism, P (7) 153.
Ferolite, Ltd., and Clapp, H. B. Crucibles, retorts, etc., P (11) 256.
Ferrari, F. Cement mixt., P (6) 121.
Fesler, M. A. Burner, P (9) 206, 207; Liquid-fuel burner, P (9) 206.
Fichter, M. and A. To tarnish or etch glass surfaces, A (2) 28.

Fieldner, A. C. Analyses of mine and car samples of coal collected in yrs. 1916–1919, A (2) 5; Coal, A (6) 138.
Filon, L. N. G., and Harris, F. C. The diphasic nature of glass, as shown by photo-elastic observations, A (11) 247.
Fink, G. J. See Holmes, M. E.
Fischer, R. New viscosimeter for viscous subs., A (6) 135.
Fitzgerald, F. A. J. Elec. arc fur., P (6) 135.
Fleck, C. Chromate-albumin copying process as etching basis for glass, etc., A (2) 30.
Fleisher, W. L. See Lissauer, A. W.
Fleming, A. G. Study of conditions causing disintegration of cement under the "accelerated" test, A (3) 66.
Fleming, A. P. M. Some developments in insulating mats. and processes in Great Brit., A (3) 52.
Fleury, P. Molybdenum resist. vacuum fur., A (5) 113.
Flinn, A. D. Research for engineering soc., A (3) 46.
Flint, F. C. Feldspar for glassmakers, A (7) 152.
Flood, L. W. Dry pressing refrac. shapes, A (5) 99.
Flugge-de-Smidt, R. A. H. Notes on evolution of the konimeter, A (6) 135.
Flusin, G. Silica glass, its properties, history and manuf., A (4) 71.
Foltz, A. Symposium on casting, A (12)282.
Ford, W. E. Dana's Text-book of Mineralogy, B (5) 108.
Fornander, E. Reducing ores in elec. blast fur., P (2) 21.
Forsyth, G. M. Lustered pottery; ancient and modern, A (6) 120.
Foster, C. E. Pyrometers as applied to pottery indus., A (6) 133.
Foulk, C. W. New form of precision hydrometer, A (9) 201.
Fouracre, R. A simple instrument for testing refractive indices of liquids, A (2) 9.
Fowle, A. E. App. and method for drawing two sheets of glass in separable contact with each other, P (7) 155.
Fox, C. A. Building block compn., P (6) 122.
Fox, C. S. Glass manuf. (India), A (4) 72.
France, W. A. Manuf. of self-hardening refrac. articles, P (8) 182.
Francis, C. W. Acid elec. fur. practice, A (2) 18; Basic elec. fur. opern., A (2) 19.
Frank, E. Hollow glass articles, P (3) 64.
Fraser, G. H. Crushing machine, P (9) 203; Machine for crushing or grinding, P (9) 204; Pulverizing mill, P (9) 204.
French, J. W. Abrasives and polishing powders for glass, A (2) 29; A (7) 152; Optical glass. Its properties and production, A (2) 28.
Fricke, R. Aluminium hydroxide and "aluminic acid," A (2) 14; Rubbing of glass walls with glass rod, A (2) 28.
Friedrich, C. O. Elec. flue-gas examiner, A (2) 8.
Friedrich, O. App. for meas. high temps., A (2) 9.
Frink, R. L. Frequency of charging batch into fur., A (2) 27; Glass molds, P (3) 63.
Frohman, E. D. Refrac. mat., P (6) 132.
Frozeth, E. E., and Blixt, T. Fire arch for fur., P (8) 182.
Frydlender, J. H. Commercial application of electroösmosis, A (5) 116.
Fuha, K. Coloring glasses with cobalt compds., A (7) 151; Coloring glass with nickel, A (3) 58; Improvement in boro-silicate glass, P (3) 63.
Fujiyama, T. Process of burning pulverized fuel in which Port. cement is obtained as by-product, P (3) 67.
Fukata, S. Purification of gypsum, P (8) 184.
Fukudo, Y. Study of cast iron enamels, A (11) 241.
Fukuoka, D. Process of under-glaze coloring, A (3) 55.
Fukuzawa, S., Fukuzawa, I., and Gips Co. Process of mfg. plaster of Paris, P (3) 67.
Fuller, J. W. Application of pulverized coal to boilers, A (2) 7.
Funk, W. Expts. on the low-temp. final firing of porcelain, A (11) 258.
Fuwa, K. Color given to glass by antimony oxide, A (11) 244; Color given to glass by tungsten, A (11) 242; Color given to glass by vanadium, A (11) 243; Color imparted to glass by chromium, A (11) 243; Coloring action of molybdenum on glass, A (11) 243; Manganese compds. as glass colorants, A (11) 243.

G. C. Gyratory crushers, A (2) 33.
Gaillard, J. Calite, new alloy resist. to high temp., A (8) 185.
Gardner, J. H. Sir Wm. Crooke's anti-glare glasses, A (5) 96.
Garvin, M. See Chaudron, G.
Gaskill, J. A. Tilting oil-fired crucible fur. adapted for melting metals, P (6) 132.
Gaston, R. M. Ball testing app. for estn. of resiliency of metals, rubber or other mats., P (6) 136.
Gaudin, A. M. See Taggart, A. F.
Gehlhoff, G. Vol. production of incandescent lamp bulbs, A (10) 217.
Geiger, C. F. Muffle fur., P (10) 228.
General Electric Co. Glass, P (7) 155; Thermostats, P (2) 10.
Gerlach, E. Catalysis in glass formation, A (10) 217; Ht.-insulating mat. and method of manuf., P (12) 289.
Gianoli, G. The ht. balance of glass leers, A (7) 153.
Gibson, A. H., Lea, F. C., and Griffiths, E. The effect of enamel on transmission of ht., A (11) 242.
Gill, G. M. Use of refrac. mat. in gas works, A (9) 199.
Gillett, H. W., and Mack, E. L. Elec. brass fur. practice, A (7) 161.
Gillot, M., and Guillermin, V. Ht. elec. steel fur., A (8) 185.
Glasenapp, M. von. Chemism of hardening of Roman dolomitic cements; colloidal form of hydrated lime, A (10) 214; Crystalloids and colloids in theory of cement, A (10) 216; Energy of crystn. of calcium sulfate dihydrate, and "regenerated" gypsum, A (11) 239.
Goddard, W. T. Elastic cement, P (6) 121; Insulator, P (9) 200; P (10) 226, 227; Strain insulator, P (10) 226.
Goldschmidt, V. M. Proc. of producing magnesium nitrate, P (8) 189.
Good, R. Manuf. of glassware, P (12) 279; Melting glass, P (3) 64.
Goslich. Free calcium hydroxide in hardened Port. cement, A (11) 238; How much water is chem. combined in a hardened Port. cement? A (11) 238.

Gossner, B. Chem. constitution of silicates, A (2) 13.
Goucher, F. S., and Ward, H. Prob. in viscosity: Thickness of liquid films formed on solid surfaces under dynamic conditions, A (5) 113.
Graham, H. W. B. Brick machine, P (9) 196; Brickmaking app., P (8) 181.
Granger, A. Burning of porcelain with fuel oil, A (12) 283; Firing of ceram. products in elec. heated fur., A (3) 45.
Granger, M. A. Pot bank firing with petroleum residues, A (4) 79.
Gravely, J. S. Removing rust from metals, P (11) 242.
Gray, J. H. Mat. for fur. walls, P (6) 132.
Gray, W. Glass-drawing app., P (8) 177, 178.
Greenwood, W. W. Magnesia refrac., P (10) 226; Segmental abrasive wheel, P (12) 272.
Griffin, M. L. The plant manager and the chemist, A (4) 83.
Griffiths, E. See Gibson, A. H.
Grigorovitch, K. P. Elec. fur. for melting of steel, A (3) 52.
Grindle, A. J. Powdered coal as a fuel in foundry, A (2) 6.
Green, M. M. Rapid detn. of potash in acid-insol. silicates, A (7) 169.
Greenburg, L., and Smith, G. W. A new instrument for sampling aerial dust, A (4) 78.
Gregg, A. W. Elec. fur., P (7) 166.
Grocholl, K. New cupola lining, A (5) 100.
Groenwall, A. See Leffler, J.
Grönwall, E. A. A. Method and device for htg. mat. in elec. fur., P (8) 186.
Gross, W. Sepn. of graphite by froth flotation method, A (4) 77.
Grout, F. F. Graphic study of igneous rock series, A (5) 107.
Grover, J. E. Compn. of matter for cleaning crystal and glassware, P (8) 190.
Grün, R. Remelting of acid blast-fur. slags and cement, A (3) 65.
Grün, R., and Biehl, K. The three-component system: lime, silica and alumina, A (11) 268.
Guillermin, V. See Gillot, M.

H. C. Franco-Belgian Assn. for testing mats., A (12) 273.
Haas, B. Improvements in manuf. of magnesia cement, A (7) 148.
Hadley, H. L. Clay pavement, P (6) 128.
Haegermann, G. Behavior of hardened Port. cement under pure water, A (10) 215.
Hagaman, M. Washtub, P (11) 259.
Hagener, A. See Slater, W. A.
Hagiwara, K., Morimoto, K., Ueda, K., and Hiraoka, T. Study of glass, A (3) 58.
Hahn, F. v. See Ostwald, I. W.
Haire, R. E. Method for making plastic gypsum, P (8) 189.
Hale, J. W. See Cone, E.
Hall, F. W. App. for manuf. of aluminum chloride, P (12) 272.
Hallatt, H. H. The re-circulation drier uses little power, A (12) 283.
Halle, B. A proposal for the establishment of new scale of hardness for glass and crystals, A (11) 260.
Hallimond, A. F. Glauconite from green sand near Lewes, Sussex: constitution of glauconite A (3) 49.
Hambloch, A. Increasing the resist. of cement to sea water by the addn. of trass, A (2) 36.
Haney, M. Abrasives—outline of their history, A (4) 70.
Hansen, O. I. Calcg. ht. losses in fur., A (7) 169.
Hantf, E. A. See Moore, W. E.
Harder, O. E. Improvement in crusher steel is suggested by metallographic tests, A (9) 202.
Hardinge, H. W. App. for entraining and removing fines from conical mills, P (8) 186; Oversize return for mills, P (8) 186.
Hardoncourt, A., Jr. Channel brick, P (11) 254; Clay shingle block and wall construction, P (10) 223.
Harkins, W. D., and Feldman, A. Films. Spreading of liquids and spreading coeff., A (5) 113.
Harris, F. C. See Filon, L. N. G.
Harris, J. E., and Schumacher, E. E. Meas. on gases evolved from glasses of known chem. compn., A (5) 96.
Hart, E. Text-book of Chem. Engineering, B (5) 114.
Hartman, M. L., Sullivan, A. B., Allen, D. E. Elec. resistivity at high temps., A (2) 18.
Hase, R. A thermoelement for radiation meas., A (9) 202.
Hatanaka, T. Mat. for artificial stone, P (3) 67.
Hattori, T. Effect of aeration on properties of Port. cement, A (7) 143; Reagents used in etching cement clinker for examn. of its microstructure. Microscopic study of cement clinker III, A (7) 143.
Heath, F. Pilaster construction, P (7) 158.
Hedvall, J. A. Color of iron oxides, A (2) 14.
Heinel, C. Stoneware as mat. for the construction of app. and machines, A (11) 259.
Heiser, A. Defects in manuf. of Port. cement, and their causes. A (2) 35; The draft in rotary kilns, A (11) 261.
Helbig, A. B. Dangers of powdered fuel, A (3) 45.
Hendrickx, J. High-strength cements, A (2) 36.
Henshaw, S. B. App. and method for flattening sheet glass, P (7) 155; Method of and app. for drawing sheet glass, P (10) 220.
Herman, J. Laws of crushing, A (9) 211.
Hermant, G. Use of waste slate for brick making, A (7) 156.
Herrmann, R. Scleroscope, P (6) 136.
Herschel, W. H. Improved MacMichael viscosimeter, A (9) 201.
Hess, H. W. Annealing of glass, A (3) 62; Annealing and ht. treatment of gage glass, A (2) 28; Boiler gage glass probs., A (3) 62; The chemist in the glass factory, A (4) 73; Detecting stoppages in fur. by vacuum readings, A (4) 73; Fire polishing glassware, A (4) 73; New glass fur. types in Eng. and Europe, A (12) 275; Operating life of tanks, A (4) 73; Raw mat. selection A (4) 73; Testing gage glasses, A (3) 62.
Hetherington, A. L. Early ceram. wares of China, B (4) 86.
Heuer, R. P. Ajax-Wyatt fur. in the brass-mill casting shop, A (5) 100.
Hirano, K. Crucible fur. for mfg. glass, P (2) 31; Rept. on Manchurian magnesite, A (3) 52; Talc porcelain, P (9) 199.
Hiraoka, T. See Hagiwara, K.
Hirsch, H. Slag action on refrac. linings, A (6) 131.

Hitchcock, H. K. Drawing glass sheets, P (11) 248.
Hobson, R. L. The wares of the Ming dynasty, B (10) 230.
Hodkin, P. W., and Turner, W. E. S. The action of water and steam under pressure on some soda-lime-silicate glasses, A (11), 246.
Hodkin, T. W. See Dimbleby, V. M.
Hodkins, F. W. See Turner, W. E. S.
Hodsman, H. J. See Wedgwood, P.
Hogenson, W. Charging app. for enameling fur., P (12) 274.
Hokanson, M. Method of sepg. granular solid mat., P (9) 204.
Holladay, L. L. Resistivity of vitreous mats., A (7) 153.
Holmes, C. W. H. Investgn. of factors influencing grain and bond in molding sands, A (2) 7.
Holmes, G. E. Oil-shale retort, P (9) 212.
Holmes, H. N. A bibliography of colloid chemistry, B (6) 140; Removal of scale and rust from iron and steel, P (12) 274.
Holmes, M. E., and Fink, C. J. Fund. physical and chem. properties of commercial lime. The available lime content, A (2) 34.
Holmes, W. H. Making of watch crystals, A (5) 95.
Holtedahl, O., and Andersen, O. Dolomite (Norway), A (6) 129; Norwegian dolomite, A (9) 199.
Holz, H. A. Elastic column dynamometer for hardness testing, A (6) 135
Horäk, M. V. Unbreakable glass in Czecho-Slovakia, A (4) 72.
Horak, W. Resistant glass. Procedure for making, A (12) 275.
Hordk V. Glass manuf., P (12) 280.
Horstkotte, E. H. Elec. resist. fur. for melting brass or copper, P (2) 20.
Horváth, B. Crude aluminum ores in Hungary, A (12) 13; Rept. from the chem. lab. of Royal Hungarian Geol. Surv., A (2) 14.
Hosiba, S. Vapor press. of arsenic. Detn. of v. p. of metallic arsenic, A (9) 200.
Howard, H. Manuf. of sodium fluoride, P (11) 265; Process of making sodium-silico fluoride, P (8) 189; P (11) 265.
Hruda, J. See Kallauner, O.
Hückel, W. Comments on the paper of A. von Weinberg: "Ht. of combustion and work of dissocn.," A (4) 79.
Huddart, R. See Ryde, J. W.
Hulett, G. A. See Burns, R. M.
Hull, W. A. Study of refrac., A (3) 52; Thermal condy. of refrac., A (2) 15.
Huntley, F. S. Making glass for Ford windshields, A (5) 95.
Hutchinson, O. C. K. App. for testing glass containers, P (2) 31.
Hüttl, A. Slip glazed ware, A (8) 184.
Hydro-Elec. Power Comm. of Ontario. Structural mats. tested, A (2) 32.

Igawa, M. Detn. of sulphate-, chloride-, and carbonate radicals contd. in soda-lime glasses, A (11) 265.
Igranic Elec. Co., Ltd. Calorimeters, P (3) 48.
Ikeda, K., Isobe, H., and Okazawa, T. Process of giving form to fuller's earth, P (3) 51.
Irons, G. E. Tunnel-kiln oil burner, P (11) 263.
Irvine, E. Optical glass, A (10) 217.
Ishida, T. See Koyama, K.
Ishikawa, G. Continuous centrifugal separator, P (3) 49.
Ishikawa, J. Gold coating mixt. for glass or porcelain, P (8) 174.
Isles, A. See Miller, J. C.
Isobe, H. See Ikeda, K.
Itaka, I. Variation of sp. ht. during melting and ht. of fusion of some metals, A (2) 12.
Ives, H. E. High-temp. meas., P (9) 204.

J. B. Thermochemistry of (cement) vertical kilns, A (2) 33.
J. L. The Michell viscosimeter, A (5) 112.
Jackson, F. G., and Shaw, L. I. Purification and anal. of zirconium dioxide, A (5) 111.
Jacobs, W. J. App. for drawing sheet glass, P (7) 154.
Jacobus, D. S. Cement-kiln system, P (11) 240.
Jagger, P. B. Molding and compacting plastic, fluid, powdered, granular, or like subs., P (4) 78.
Jakob, M. Meas. of thermal condy. of liquids, insulators, and metals, A (2) 8.
Jeanneret, F. B. Tests on double burning of lime, and value of cements of high hydraulic index, A (3) 65.
Jeffery, J. A. Ceram. elec. insulating mat., P (6) 134; Fur. for decorating ceram. ware, P (12) 285; Refrac. ceram. ware, P (6) 132.
Jeppson, G. N., and Beecher, M. F. "Safety-tread" ceram. tile, P (6) 134.
Jette, A. N. Reverberatory fur., P (4) 81.
Johannsen, A. Essentials for microscopical detn. of rock-forming minerals and rocks, B (5) 108.
Johnston, R. See Pile, S.
Jolibois, P., and Lefebvre, P. Drying of plaster and its conservation in humid air, A (10) 214.
Jones, A. F. Hollow tile building block, P (4) 75.
Jones, D., and Emery, W. Jointing mat. for refrac., A (11) 255.
Jones, L. T. New rotary mercury pump, A (3) 48; Simplest mercury vapor pump, A (3) 48.
Jones, W. R. China clay deposits in Malay, A (12) 286.
Jones, W. R. R. Refrac. silica mat. of S. Wales, with special ref. to the influence of texture, A (11) 255.
Jordan, W. L. See Elsenbast, A. S.
Jordon, F. G. Damproofing concrete body, P (4) 84.
Jugovics, L. See R. Balle.

Kaisha, H. See Nakamura, H.
Kallauner, O., and Hruda, J. Effect of U_3O_8 upon fusibility of Zettlitzer kaolin, A (5) 110; Occurrence of vanadium in ceram. raw materials and ware and its effect upon fusibility as well as color and formation of scum on pure kaolin and brick clay, A (3) 57.
Kamibayshi, C. See Kata, K.
Kamita, K. Effect of alumina in retarding the devitrification of glass, A (6) 123.
Kasugai, I. Sagger, P (7) 165.
Kato, K. Waterproof hardening agent of cement, P (8) 175.
Kato, K., and Kamibayashi, C. Process of mfg. paving mat., P (3) 67.
Kato, T. On the test of chem. glasses, A (11) 245.
Kawamoto, T., and Kato, G. Porcelain having the appearance of granite, P (8) 184.
Keele, J. Rept. of work of ceram. division, A (6) 138.
Keeney, R. M. Elec. reverberatory fur. adapted

for smelting ores, P (6) 132; Tilting elec. arc crucible fur. for smelting silver ore, P (6) 135.
Keinath, G. Personal equation errors in optical pyrometry, A (6) 135.
Kelly, A. Process for manuf. of borax and boric acid, P (8) 189.
Kelly, C., and Belvoir, T. Building block, P (10) 222.
Kenney, A. W. Colloid mill and ultra-filter press., A (5) 105.
Keppeler, G. Basis of progress in the glass indus., A (10) 217; On the reln. between the compn. and chem. resist. and chem. attack of glass, A (12) 274.
Kiefer, E. F. Elec. fur., P (12) 285.
Kikuta, T. Growth of cast iron, A (2) 31.
Kimura, S. Slag cement and dolomitic cement, A (7) 144.
King, W. Chelsea porcelain, B (4) 84.
Kingsbury, P. C. Unique development of modern chem. stoneware, A (3) 54.
Kinzie, C. J. See Barton, L. E.
Kirk, C. J., and Brain, G. Porcelain tank and process of making the same, P (9) 200; Process and mold for forming earthenware articles and product thereof, P (9) 200.
Kirk, R. E. The manuf. of Port. cement from marl, A (11) 239.
Kirlin, I. M. Proc. of making hollow panes of glass, P (8) 178.
Kishi, I. Pitch-cement, P (3) 67.
Kishimoto, T. Roofing-tile kiln, P (3) 46.
Kissner, H., and Blum, D. Tool for decorating crockery, P (8) 184.
Klaften. Ht. losses in glass manuf. and their control, A (2) 29.
Kleeman, R. D. Effect of dissolved subs. on deposition of colloidal particles from a soln. by means of elec. current, A (4) 82.
Klein, A. A., and Beecher, M. F. Nonslip tile, P (9) 200.
Klein, A. S. Upright (lime) kilns, A (11) 238.
Klinck, O. New calcn. for detn. of strength of flanges, A (6) 135.
Klinefeldt, H. J. Ball and pebble milling for pulverizing and mixing, A (2) 5.
Kliuefelter, T. A. Some notes on mat. and process in elec. porcelain manuf., A (8) 184; Symposium on casting, A (12) 282.
Knapp, L. H. Status of elec. fur., A (4) 80.
Knight, M. A. Acid- and chem.-proof stoneware, A (10) 226.
Knight, N. Chem. study of dolomites, A (10) 225.
Knorrn, R. Modern window glass plant, A (10) 217.
Knothe, W. J. Graphic check on glass-works opern., A (11) 246.
Knowles, J. A. Process and methods of medieval glass paintings, A (6) 124.
Kohama, H. Centrifugal water separator, P (3) 49.
Kolzner, J. (Coal.) Clinker brick, A (10) 222.
Kondo, S. Microscopic structure of common brick, A (11) 253.
Kondo, S., and Nakao, M. On absorption test of common brick, A (3) 55.
Kóno, S. Glass-melting fur., P (6) 126.
Koreavaar, A. Theory of gas producers and its application to blast fur. operations, A (3) 46.
Koyama, K., Ishida, T., and Nakamura, Y. Roofing tile industry in Ishikawa prefecture, A (11) 257.
Krak, J. B. Avoiding errors in the analysis of glass sand, A (11) 246; New plant of U. S. Sheet and Window Glass Co. at Shreveport, La., A (3) 61; Notes on glass etching, A (5) 96.
Kraus, C. A., and Darby, E. H. Conduction process in ordinary soda-lime glass, A (5) 96.
Kraus, L. P., Jr. Proc. for making refrac. products, P (7) 162.
Kreisinger, H., and Blizard, J. Powdered coal as fuel in steam plants, A (5) 116.
Kreitzer, H. R. Wall construction, P (9) 197.
Krenger, H. Effect of low temps. on hardening of cement, A (10) 216.
Kroonen, L. Building construction, P (9) 197.
Krusee, A. W. Bldg. construction, P (8) 180.
Kucera, P. Matrix device for molds, P (7) 154; Method of mfg. ring molds, P (7) 154.
Kühl, H. Copper ruby glass, A (3) 62; Fineness of raw mix, strength, and impact test, A (11) 239; Prob. of Ger. glass indus., A (4) 73.
Kuwayama, M. See Takamatsu, T.
Kyle, R. T. Kiln, P (4) 80.

Ladoo, R. B. Barytes, occurrence, mining, uses, A (6) 139; Bauxite: Occurrence, mining and uses, a (6) 128; Fluorspar mining in the western states, A (11) 264.
Lafon, P. Anomalies in expansion of glasses, A (6) 125.
Langenkamp, A. G. See McElroy, R. H.
Larcheveque, M. M. Study of warpage of refrac. mixts., clays, kaolin, and porcelain when fired at different temps., A (10) 221.
Larmour, H., and Stevenson, W. C. Ht. efficiency increase in cement burning, A (2) 35
Larsson, T. Dressing tool for grinding wheels, P (9) 194.
La Vercombe, H. H. Grinding-wheel-test device, P (8) 172.
Lax, E. See Pirani, M.
Lea, F. C. See Gibson, A. H.
Lebrun, R. Note on formation of Alsatian potash basing, A (6) 137.
Lecrenier, A. Chem. glass and hard glass, A (11) 247.
Lefebvre, P. See Jolibois, P.
Leffler, J., and Groenwall, A. Manuf. of elec. fur. steels, A (4) 79.
Le Franc, C. See Boudouard, O.
Leicester, C. H. Interlocking brick, P (4) 75.
Leiss, C. Refractometer for detn. of solid and liquid subs., A (2) 8.
Leissler, D. Enameling oven, P (7) 149.
Lents, J. M. Means for transferring molten glass, P (8) 178.
Lessell, J. B. Manuf. of ornamented ware, P (12) 272.
Longnaker, M. S. Excavating mach., P (8) 186.
Levy, L. Control of works operations by sci. instruments, A (5) 117.
Lewis, J. V. Abrasives, A (2) 21.
Liddell, D. M. Handbook of Chem. Engineering, B (5) 114.
Lidstone, F. M. Full effect of variable head in viscosity measurements, A (5) 111.
Liempt, J. A. M. van. Binary systems Na_2SiO_3–Na_2WO_4, K_2SiO_3–K_2WO_4 and Na_2WO_4–K_2WO_4, A (2) 26; Vapor press. and sublimation curves for some impt. metals, A (4) 82.
Liljegran, E. W. Baffled gas scrubber and fume arrester, P (4) 78.

Lillibridge, H. D. Ceram. press., P (4) 78; Crucible of chem. porcelain, P (6) 134.
Lindsay, R. F. Requirements of a refrac. mortar, A (11) 256.
Linebarger, C. E. Hydrometer, P (3) 48.
Liptak, M. Brick-faced metallic trim, P (9) 196; Brick trim for walls, P (9) 196; Fur. wall, P (11) 256, 257; Partition wall for fur., P (11) 256.
Lissauer, A. W., and Fleisher, W. L. Humidifying app. control, P (10) 227.
Liston, N. A. App. for making wire glass, P (12) 277.
Little, G. M. Elec. fur. resistor, P (9) 205; Elec. fur. wall construction, P (9) 205; Elec. resist. fur., P (6) 136; P (9) 205; Protected electrode for elec. fur., P (9) 205; Telescoping electrode protector, P (9) 205; Tubular resist. elec. fur., P (6) 135.
Locke, F. M. Glass, P (3) 64; P (4) 73.
Lösenbeck, O. Investigation of elec. properties of silica acid sols, A (3) 50.
Loeser. Glass fur. temp., A (6) 123.
Loewen, H. The sci. of colloids, A (2) 6.
Lohman, C. J., Jr. B. t. u. chart, A (5) 111.
Lorenz, W. A. Process of and app. for feeding molten glass, P (8) 177.
Lott, C. R. App. for producing charges of molten glass, P (10) 220.
Louis, D. Refractories, P (3) 53.
Lovejoy, E. Burning a down-draft kiln, A (2) 3; Coloration, discoloration and other burning effects, A (5) 96.
Lowry, T. M. Barytes standardization, A (5) 110; A new elutriator for rapid use, A (2) 9.
Lowry, T. M., and McHatton, L. P. Further expts. on the meas. of color, A (11) 236; Grading of powders by elutriation, A (3) 47.
Lucchesi, F. Rapid tech. estn. of iron oxide and alumina in clays and their products, A (9) 211.
Luce, G. E. Method of and means for burning brick, P (7) 167.

M. E. P. Greek terra cottas, A (12) 272.
MacDonald, R. See Richmond, H. A.
Mack, E. L. See Gillett, H. W.
Mackay, P. A. Method of recovering vanadium from its ores, P (8) 188.
MacLellan, A. D. Percentage feeder and mixer, P (11) 260.
MacMichael, H. A. Pottery making in the Blue Nile, A (3) 54.
MacMichael, R. F. App. for analyzing flue gases, P (6) 136; Tests to det. uses for clay, A (3) 44.
Malmed, A. T. Strengthening compn. for cement mixt., P (6) 122.
Malowan, S. L. Tantalum and its tech. uses, A (9) 210.
Manchot, W. Identity of amorphous and cryst. silicon, A (5) 113.
Manly, J. J. Protection of brass wts., A (5) 116.
Mano, N., and Yanaka, R. Paint for waterproofing cement, P (3) 67.
Marckworth, O. S. Non-shatterable glass, P (3) 64.
Marino, Q. Metallizing articles, P (8) 174.
Marko, S. Process of treating shale, P (9) 212
Marlow, H. J. Gas-fired oven or kiln, P (7) 167.
Marshall, A. E. Pyrex glass as mat. for chem. plant construction, A (5) 96.
Martin, F. M. App. and method for sampling ores, P (8) 190.
Martin, J. C., Jr. Interlocking brick, P (4) 76.
Martinazzoli, A. The Fiat elec. fur., A (4) 80.
Matejka, J. Chem. reln. of kaolinite at high temp., A (2) 13.
Mathews, J. A. Elec. fur. produce quality steel, A (3) 52; Present status of the elec. fur., A (4) 80.
Mattison, R. V. Asbestos-cement, P (3) 67.
Maurach, H. Tech. of the glass fur., A (10) 217.
Maus, F. App. for dehydrating solid subs., P (4) 78.
Mayers, W. S. Leers, A (5) 96; Modern glass factory equipment, A (2) 31; A (5) 96.
McBride, R. S. Natl. Bur. of Stand., A (4) 82.
McDermott, G. R. Automatic governor for gas producers, P (6) 139.
McDonald, J. U. Fur. contg. melting pots or crucibles, P (3) 64.
McDougal, T. G. Spark-plug insulation, P (4) 77; Symposium on casting, A (12) 282.
McDougal, T. G., and McDowell, S. J. Fused ceram. bearing, P (6) 134.
McDowell, S. J. See McDougal, T. G.
McElroy, R. H., Cite, J. D., and Langenkamp, A. G. Brick and tile mach., P (8) 181.
McGree, E. C. Comparison of the modulus of rupture of silica bricks, hot and cold, A (9) 199.
McHatton, L. P. See Lowry, T. M.
McIntire, C. V. Coal gas collecting main and ascension pipe, P (4) 81.
McLaughlin, W. Recuperator for glass fur., P (4) 81.
Meigs, C. C., Bassett, H. P., and Slaughter, G. B. Rept. on Texas alkali lakes, P (9) 209.
Mellen, A. W., Jr. See Pond, H. O.
Mellor, J. W. Physics in ceram. indus., A (8) 187; See Moore, B.
Mennecke, M. French potash indus., A (9) 210.
Menzies, A. W. C., and Beebe, R. Forms of gas and liquid cavities in gels, and their interpretation by surface compression, A (3) 50.
Merwin, H. E. See Posnjak, E.
Meston, A. F. App. for scrubbing coal gas, P (6) 140.
Metallbank und metallurgische Ges. Akt. Ges. Elec. dust ppn., P (3) 47.
Metallister Ges. P (7) 170.
Meurer, N. Enameling, P (3) 65.
Middleton, J. Clay in 1921, A (6) 139.
Miki, S. Magnesia sheet, P (3) 67.
Miller, E. Glass-feeding mech., P (12) 279.
Miller, J. C., and Isles, A. Gas producer, P (4) 81.
Miller, W. J. App. for mfg. glass articles, P (4) 74; Process and app. for feeding glass, P (8) 177; P (11) 250.
Miner, H. S. Grasselli medal award (to W. H Fulweiler), A (3) 46.
Minton, R. H. Historical sketch of pottery indus., A (3) 45; New Jersey's part in the ceram. history of Amer., A (8) 189; Symposium on casting, A (12) 282.
Mitchell, A. E. Studies on dolomite system. I. The nature of dolomite, A (10) 225.
Mitchell, S. A. Car for tunnel kilns, P (11) 262.
Moats, T. B. Removable-top continuous kiln, P (7) 168.
Moldenke, E. Treating alunite, P (11) 256.
Montgomery, G. L. Handling finished products of indus., A (2) 24.
Montgomery, G. M. Modern handling methods in manuf. of elec. porcelain, A (3) 55.

Moore, B., and Mellor, J. W. Note Books of Josiah Wedgewood, A (7) 142.
Moore, E. T. Recent elec.-fur. developments, A (9) 198.
Moore, W. E. Elec. fur., P (6) 131; Elec. metallurgical fur., P (6) 131.
Moore, W. E., Alter, H. F., Hantf, E. A., Eckley, J. R., and Wright, F. Elec. arc fur. of the rocking type, P (6) 136.
Moorshead, T. C. Mach. for making pressed glassware, P (8) 177.
Morey, G. W. Soly. and decompn. in complex systems (glass and ceram. ware), A (3) 59.
Morey, G. W., and Bowen, N. L. Melting of potash feldspar, A (3) 61.
Mori, J. On the thermal expansion of soda-lead glass, A (11) 244.
Morimoto, K. See Hagiwara, K.
Moyer, A. C. See Wirrer, G.
Mugdan, S. See Ruff, O.
Muirhead, E. M. M. See Dimbleby, V.
Mullen, J. I. Ore concentrator, P (11) 261.
Murrill, P. I. Process of making vulcanization accelerators, P (7) 170.
Musiol, C. Correct notions on fluoride enamels, A (11) 242.
Meyers, T. A. Packing for pistons, P (12) 282.
Myers, W. F. Storage and transportation of Port. cement, A (3) 65.

Nacken, R. Thermochem. research on cement, A (7) 148.
Nacken, R., and Schoppe, G. Meas. of the temp. of rotary cement kilns, A (2) 35.
Nagasaki, S. Process of mfg. ht.-insulating wares, P (3) 55.
Nagasawa, T. Enameling fur., P (3) 65.
Nagaya, S. On the crushing strength of concrete and propn. of its mat., A (11) 238.
Nakamura, H., Nakamura, K., and Kaisha, H. Graphite crucible, P (7) 162.
Nakamura, K. Graphite crucible, P (12) 282; Marble cement, P (3) 67; See Nakamura, H.
Nakamura, S. Examn. of glass by polarized light, A (3) 61.
Nakamura, Y. See Koyama, K.
Nakao, M. See Kondo, S.
Naske, C. Die Portlandzementfabrikation, B (7) 149.
Needham, E. F., and T. H. Wall construction, P (8) 180.
Negbaur, H. Ovenware and holder therefore, P (8) 176.
Nelson, R. A. Thermal condy. of white marble and "Neat" cement, A (2) 35.
Neugebauer, H. The dispersoid chemistry of gypsum. II. Research on anhydrite, A (2) 36.
Neuray, L. Modern radiation pyrometers, A (2) 9.
Nesbit, C. E., and Bell, M. L. Fire brick disintegration, A (10) 223.
Newcomb, R. W. New type of automatic temp. regulator and its application to ht.-treating fur., A (3) 48.
Nichols, W. H. Ernest Solvay, an appreciation, A (3) 46.
Nicolardot, P. Comparison of Fr., Eng., Ger. and Austrian lab. glassware, A (10) 217.
Nihoul, A., and Clerc, C. Process for the manuf. of zinc white, P (11) 265.
Niimura, S. Process of mfg. ignition-plug and other refrac. porcelains, P (3) 55.
Nord, N. A. Masonry structure, P (7) 158.
Normile, T. China clay in Calif., A (10) 226.
Norris, P. B. Fluid-fuel burner, P (9) 207.
Norris, W. F. Medieval glass of York Minster, A (5) 94; A (10) 218.
Norsk Aluminum Co. Decompn. by acids of siliceous alumina compds., A (12) 288.
North, C. L. Bricks, P (6) 122.
Northrup, E. F. High-temp. investigation, A (9) 211.
Norton, C. L. Method of molding brick shapes, P (8) 182.
Norton, L. E. Swelling of sand upon absorption of moist. and its effect upon batch mixing, A (6) 139; See A. W. Dickenson.
du Noüy, P. L. New viscosimeter, A (8) 188.

Odelberg, A. S. W. The "Dorr" mill, A (6) 135.
Ohman, J. L. Refrac. compn., P (10) 226.
Okazawa, T. Studies on clays. I. The acidic reaction of Jap. acid clays, A (11) 266; See Ikeda, K.
Oki, S. Waterproofing reagent for concrete, P (7) 149.
Olsson, Z. Refrac. mat., P (6) 132.
O'Neill, F. Fur., P (2) 31; Glass-handling app., P (11) 248.
Orcel, J Prochlorites of corundum-bearing rocks, A (10) 225.
Ormandy, W. R. Purification of clay, A (2) 11.
Orton, E., Jr. Address at dedication of new ceram. bldg. at Rutgers Coll., A (3) 45.
Ostwald, W. What progress has sci. of color brought? A (3) 46.
Ostwald, W., and Hahn, F. V. Kinetic flocculation meters, A (2) 9.
Ottman, F. Refrac. ht.-insulation, P (4) 76.
Owens, M. J. Mechanism for conveying hot glassware, P (8) 179; Sheet-glass-drawing mechanism, P (12) 277.
Owens, T. S. Sheet-glass-drawing mechanism, P (11) 249.
Owles, A. B. See Sinnatt, F. S.

P. C. Treatment of calcareous clays, A (7) 156.
Pape, W. See Tamman, G.
Parkert, O. Application of self-luminous colored decorations in glass and ceram. indus., A (3) 63.
Parkin, M. See Dimbleby, V. M.
Parks, C. W. Fur. gas producer, A (2) 5.
Parr, P. H. Air humidity and drying, A (7) 170.
Parr, S. W. Standardization of lab. gas cocks, A (4) 77.
Parravano, N., and Rosselli del Turco, C. The influence of fluxes on the transformations of quartz, A (11) 267.
Passow, H. Free lime in a Port. cement clinker, A (11) 238.
Pazsiczky, G von. App. for production of spun glass, P (4) 74.
Peacock, S. Alkali metal silicate production in blast fur., P (3) 64.
Pearson, R. E., and Craig, E. N. Reduction of oxides of metals of chromium group, P (8) 189.
Pease, G. S. Refrac. oxychloride cement, P (3) 53.
Peerson, A. H. Rotating or oscillating elec. fur. plants, P (6) 136.
Peiter, F. Rotary kiln adapted for roasting bone-black or fuller's earth.

Pelc, J. Hardening plaster, mortar or cement contg. lime, P (7) 148.
Penfield, R. C. App. for unloading kilns by conveyor belts, P (8) 180; App. for unloading kilns by hopper, lifting device, or the like, P (8) 179.
Petts, E. Burning in up-draft fur. kilns, A (5) 96.
Pickston, W. T. See Brown, W. D. R.
Pike, R. D. Ore-roasting fur., A (9) 211.
Pile, S., and Johnston, R. Tested methods of non-ferrons metallurgical analysis, B (5) 114.
Pirani, M., and Lax, E. Observations made on electrolytic migration of sodium through glass, A (4) 72.
Pite, A. B. Ceram. in field of architecture, A (6) 120.
Platzmann, C. R. Indus. chemistry prob. relative to treatment of cement, A (3) 66; Protection of cements against action of acids A (10) 215.
Plauson, H. Remarkable grinding mill, A (4) 77.
Plauson's Patent Co., Ltd. Refining clay, P (3) 51.
Plowman, W. W. See Feldenheimer, W.
Ployer, A. E. Enamel-ware protector, P (8) 175.
Pocock, R. W. See Carruthers, R. G.
Poetschke, P. Phys. properties of dental cements, A (7) 148.
Pomeroy, R. E. H. Pulverizing mill, P (9) 212.
Pond, H. O., and Mellen, A. W., Jr. Brick-handling app., P (8) 180.
Popoff, A. Necessity for preheating air in fur. work, A (2) 28.
Poppenhusen, H. A., and Strong, A. P. Fire arch, P (12) 282.
Posnjak, E., and Merwin, H. E. System Fe_2O_3–SO_3–H_2O.
Poste, E. P. Standardization of enameled app. for chem. purposes, A (2) 31.
Powell, H. J. Glass-making in England, B (8) 179.
Powell, J. M. Shale planer, P (8) 187.
Powell, J. R. App. for the manuf. of bifocal lens blanks, P (8) 177.
Prat, L. Induced-draft device, P (11) 263.
Pratt, J. T. Tiling block, P (4) 76.
Prausnitz, P. H. Tech. electroösmosis, A (6) 138.
Preston, F. W. Structure of abraded glass surfaces, A (2) 30.
Prevost, P. Working limestone quarry, A (3) 65.
Pritchard, G. A. See Buckman, H. H.
Proctor, C. H. The electrodeposition of silver and copper on glass, A (11) 246.
Pukall, W. Grundzüge der Keramik, B (4) 87.
Pulfrich, M. Destruction of coke oven walls, A (9) 198.
Purdy, R. C. Essentials of meeting competition, A (10) 229.

Quensel, R. Synthetic precious stones, A (9) 211.
Quigley, W. S. Refrac. cements, A (2) 20.

R. M. Italian cement plants, A (12) 272
Radley, E. G. Chem. analysis. (Glauconite from green sand near Lewes, Sussex), A (3) 49.
Raknsin, M. A. Adsorbent properties of clay, A (11) 267.
Rankin, G. A. A study of chem. reactions in burning of lime and Port. cement, A (4) 71.
Raphélis-Soissan, L. de. Enameling, P (2) 32.
Ratner, L., and Schwartz, M. App. for testing abrasives, P (6) 136.
Rawling, S. O. Elec. htg. and controlling app. for small thermostat, A (2) 7.
Rawlins, C. D. Chem. indns. in Greece, A (3) 44.
Rebuffat, O. Silica brick, P (3) 53.
Reece, J. A See Rowley, C. A.
Reed, C. J. Process of and app. for htg. mat., P (9) 207.
Rees, W. J. Critical rev. of the provisional specif. for glass refrac. mats., A (5) 94; Durability of refrac., A (6) 129; Molding sands, A (6) 130; Refrac. for coke-oven construction, A (2) 18; Refrac. for elec. fur., A (3) 52.
Reid, T. A. Elec. fur., P (9) 207; Elec. resist. fur., P (6) 136; Resistor-supporting means, P (9) 208.
Rennerfelt, I. Elec. arc fur. adapted for melting zinc, P (2) 20; Elec. fur., P (6) 132; Elec. fur. adapted for htg. crucibles for metal or ceram. articles, P (3) 53; Elec. resist. fur. adapted for heat-treating metals, P (2) 20; Elec. fur. opern. in metal refining, P (2) 20.
Réol, J. Press for forming briqnettes, P (8) 186.
Requa, R. S. Hollow-tile wall construction, P (12) 281.
Rentlinger, E. Improvement of the firing procedure for whiteware kilns, A (11) 258.
Rhead, F. A. Romance of pottery, A (7) 142.
Richardson, W. D. Working wet lime clays, A (2) 26.
Richmond, H. A., and Macdonald, R., Jr. Aluminous abrasive and method of making same, P (12) 272; Artificial corundum, A (3) 54.
Richmond, H. D. The action of potassium carbonate on lead glass, A (11) 247.
Ricketts, E. B. Rational basis for coal-purchasing specif., A (6) 139.
Ricklefs, O. Use of low-grade fuels in brick indus., A (2) 7.
Riddell, W. C., and Schnette, C. N. Production of caustic calcined magnesite in the Scott fur., A (6) 121.
Riddle, F. H. Porcelain, P (3) 55; Production of porcelain for elec. insulation, A (9) 199; The production of porcelain for elec. insulation, A (11) 258.
Rideal, E. K. Flow of liquids under capillary press., A (5) 112.
Rideal, E. K., and Thomas, W. Adsorption and catalysis in fuller's earth, A (3) 49.
Ric, E. Influence of surface tension on melting and freezing, A (11) 267.
Ricke, R. Influence of compn. upon properties of porcelain, A (2) 21; Properties and testing of refrac., A (11) 256.
Ries, H., and Bayley, W. S. High grade clays of east. U. S., A (3) 49; High-grade clays of the east. U. S. with notes on some west. clays, B (5) 108.
Rigby, T. Drying clay, P (3) 51
Rimbach, R. Research bur. lab., Stand. Steel Car Co., A (5) 115.
Rishkevich, E. Bavarian graphite, A (5) 100.
Rittman, A. J. Glass indus. fuel waste, A (4) 73; The why and wherefore of seedy glass during melting, A (12) 275
Robinson, A. H. A. Titanium. Canada, A (9) 209.
Rochow, W. F. Refrac., with special ref. to recent developments, A (2) 15.

Rockwood, N. C. New "wet" process of lime manuf., A (10) 216.
Roesch, A. App. for controlling htg. of vulcanizers or other app.; App. for controlling humidity of air, P (3) 48.
Rohn, W. Antimony yellow glazes, A (5) 103.
Rohn, W. Elec. induction fur. for ht.-treating or melting metals, P (3) 53.
Rose, H. J. See Sperr, F.
Rose, J. B. Making and marketing of common brick, A (2) 24.
Rosenhain, W. Hardness and hardening, A (10) 230.
Rosenthal, E. See Singer, E.
Rosselli del Turco, C. See Parravano, N.
Rossman, W. F. Refrac. mat. for zinc retorts, P (3) 53.
Roth, E. Studies of changes in phys. properties of hard porcelain caused by varying feldspar from NA to K feldspar and by varying burning treatment, A (5) 102.
Rousso, J. Counting device, P (10) 216.
Rowley, C. A. See Crowley, J. P.
Rowley, C. A., and Reece, J. A. App. for cutting sheet glass, P (7) 153.
Rozlozsnik, P. Prelim. rept. on bauxite occurrences of N. Bihar, A (2) 15.
Ruff, O. Process of producing zirconium dioxide, P (8) 189.
Ruff, O., Schmidt, G., and Mugdan, S. Studies at high temp. XV. The vapor press. of the alkali fluorides, A (2) 13; Studies at high temps. XV. The vapor press. of the alkali fluorides, A (4) 82.
Rule, J. F. App. for gathering and transferring molten glass, P (7) 154.
Ryde, J. W., and Huddart, R. Anal. of bubbles in glass, A (8) 176.
Ryon, E. A. Glass-grinding mach., P (4) 74.

Sadler, A. See Thompson, E. A.
Saito, Y. Brick kiln, P (7) 167.
Sampson, E. Marketing of chromite, A (6) 128.
Sandstrum, C. O. Kiln efficiency discussed, A (2) 35.
Sato, D. Diatomaceous earth produced in the Islands of Oki, A (11) 261.
Sato, T. Improvement in kiln for burning brick and similar wares, P (7) 167.
Sauvageon, V. M. Elec. fur., P (11) 261; Glass manuf. with elec. radiation fur., A (5) 95.
Saxe, C. W. Ceram. ware and method of making same, P (7) 162.
Saxton, C. Glass forming machines, A (7) 152.
Scharschu, C. A. Refrac. mat. for fur., P (6) 131.
Schild, A. Grinding and polishing of plate glass, A (10) 217.
Schmidt, B. Clay flux for brick compn., P (6) 128.
Schmidt, G. See Ruff, O.
Schmidt, J. Air preheating for small indus. fur. htd. with water-gas and with coal, A (4) 79.
Schneider, R. Gas producer and fur. practice in glass indus., A (9) 195.
Schoppe, G. See Nacken, R.
Schreiber, P. D. of a mixt. of oxygen, carbon monoxide and carbon dioxide. Reln. between the vol. per cent and wt. per cent, A (6) 138.
Schrero, M. Water glass. A bibliography, B (7) 170.
Schriever, W. Lab. optical pyrometer; notes on its design and opern., A (9) 202.
Schrot, P. Adhesives, A (2) 3.
Schuen, W. An elec. fur. for the melting of quartz goods, A (11) 246.
Schuette, C. N. See Riddell, W. C.
Schultes, W. New diagrams for the valuation of fuel gas and flue gas anal., A (11) 268.
Schumacher, E. E. See Harris, J. E.
Schurecht, H. G. Bricks for malleable fur., A (2) 18.
Schwaiger, A. Elec. porcelain, A (2) 23.
Schwartz, M. See Ratner, L.
Schwarz, M. V. Jointed microscope for lab. and workshops, A (2) 9.
Schwarz, R., and Brenner, A. Synthetic aluminium silicate and its relations to kaolin, A (11) 267.
Schwerin, B. Elutriation of clay and kaolin, P (12) 290.
Scott, A. Application of colloid chemistry to mineralogy and petrology, A (5) 112.
Scott, G. C. Glass finishing and polishing machine, P (11) 250.
Scott, W. S. Development of indus. elec. htg. for low temp. enameling, A (3) 64.
Searle, A. B. Manuf. and uses of abrasive materials, B (7) 162.
Searles-Wood, H. D. Sand lime brick, A (12) 280.
Seaton, M. Y. Magnesium oxychloride cements, A (7) 147.
Seede, J. A. Elec. fur. app. and method of operating same, P (12) 285.
Selch, E. Dissoc. of clay by lime, A (2) 10.
Servange, H. Lime bricks, A (2) 32.
Seydel, R. Draft, resist. to draft, and progression of fire in annular kilns, A (2) 7.
Shakespear, G. M. Elec. carbon dioxide recorders, A (3) 47.
Sharp, C. L. Muffle leer fur. adapted for annealing glass, P (7) 155.
Shaw, L. I. See Jackson, F. G.
Sherwin, R. S. Alumina from low-grade bauxite or clays, A (3) 54.
Sherwood, C. J. Burner, P (9) 208.
Shigemune, R. Comparative examn. of structure of Jap. and foreign porcelains, A (7) 162.
Shimazu, G. Process of mfg. optical glasses, P (3) 63.
Shinagawa, Y., and Yoshizaka, S. Method of making wares of stones, P (3) 55.
Shorkey, F. A. Graphic method for computing ht. balance, A (11) 268.
Siemens, H. von, and Zander, H. Prepn. of pure zirconium oxide, A (9) 198.
Silica Syndicate, Ltd. Sealing elec. conductors into quartz, P (3) 63.
Simpkin, N. See Sinnatt, F. S.
Sims, C. E. Pilot-light control for fur. electrodes, A (4) 80.
Singer, F. Ceram. ware for mach., A (12) 289; Die Keramik im Dienste von Industrie und Volkswirtschaft (Ceramics in the Service of Industry and National Economy), B (10) 233.
Singer, F., and Rosenthal, E. Phys. properties of porcelain, A (2) 22.
Sinnatt, F. S., Owles, A. B., and Simpkin, N. The melting point of coal ash, A (11) 256.
Sjögren, H. Artificial precious stones, A (2) 7
Slater, W. A., Hagener, A., and Anthes, G. P. Test of a hollow tile and concrete floor slab reinforced in two directions, A (4) 75.
Slaughter, G. B. See Meigs, C. C.
Smalley, E. L. Ceram. firing in elec. fur., A (5) 105; Principles of high temp. fur. design, A (2) 19.

Smith, C. D. Producer gas as fuel for glass indus., A (3) 62.
Smith, G. W. See Greenburg, L.
Smith, R. D. Mold, P (8) 179.
Smith, T. Dispersion formulas and the secondary spectrum, A (2) 29.
Smith, W. Carbonized brick, A (8) 182; New refrac. mat., A (5) 101; A (12) 282.
Snyder, F. T Elec. fur., P (6) 131.
Sorberg, E. See Benedicks, C.
Sortwell, H. H. Amer. and Eng. ball clays, A (5) 101; Properties of some ball clays, A (2) 24.
Soubier, L. D. App. for and method of producing charges of molten glass, P (4) 74; Drawing continuous sheet glass, P (11) 248; Means for transferring glass to molds, P (8) 178; Method of and means for feeding molten glass, P (7) 154; See Ferngren, E. T.
Spackman, H. S. Alca cement, A (8) 175.
Sperr, F. W., and Rose, H. J. Elec. fur., P (6) 136.
Spindler, M. Firing and ht. econ. of the tunnel kiln, A (2) 4.
Splichal, J. Data on colloidal clays, A (2) 13.
Springer, L. Simple method for estn. of soda content of potash, A (2) 13; The staining and etching of glass, A (11) 245; Yellow etching compd., A (2) 23.
St. Reiner. Calcium aluminium silicate and zeolite question, A (9) 210.
Staff Article. Automatic kiln firebox, A (7) 158.
Stafford, C. S. Fur. for molten glass, P (6) 126.
Stahl, C. J. Flattening stones, A (11) 245.
Stansbie, J. H. Elec. fur., A (2) 19.
Stark, J. Die physikalischtechnische Untersuchung keramischer Kaoline, B (7) 169.
Steelman, L. Leer, P (8) 176.
Steger, W. Detn. of softening temp. of refrac. mats. under load, A (3) 52.
Steinberger, L. Insulator, P (8) 184; Line insulator, P (12) 285.
Steinhardt, A. Elec. htd. ceram. ware, P (6) 134.
Stenhouse, T. Method and app. for drawing glass cylinders, P (10) 220; Method of and app. for supporting glass cylinders, P (10) 220.
Stern, E. Viscosimeter, A (9) 201.
Stevens, E. P. Kiln, P (11) 262.
Stevenson, W. C. See Larmour, H.
Stocke, J., Jr. Brick-surfacing mach., P (8) 180.
Straight, M. T. Truck for handling hollow blocks and tile, P (10) 222.
Stratton, S. W. Annual rept. of the director of Bur. of Stand., 1922, A (4) 84.
Strickland, D. M. Earning power of research as demonstrated by experience of Amer. Rolling Mill Co., A (5) 117.
Stripe, W. C. Suspended fur. roof, P (8) 183.
Strock, E. J. Quarry blasting, A (10) 229.
Strong, A. P. See Poppenhusen, H. A.
Stromboli, A. Fiat elec. steel fur., A (4) 80.
Stubbs, A. J. Pottery; pigments, P (2) 23.
Sturtevant, T. J. Separator, P (8) 187.
Sugizaki, M. Waterproof tile, P (6) 121.
Sullivan, A. B. See Hartman, M. L.
Sullivan, A. P. Elec. cement, P (12) 274.
Sullivan, E. C., and Taylor, W. C. Glass, P (3) 64; Glass, P (7) 155.
Sullivan, W. J. App. for transporting and unloading brick, P (4) 78; Brick kiln and method of setting and burning, P (8) 181.
Sumner, W. E. Floor covering mat , P (6) 122.
Suzuki, T. On clay, A (11) 263.
Swientoslawski, W. New data on thermochemistry, A (11) 268.
Sylvany, R. New type of Fr. elec. fur , A (4) 79.
Syrkin, J. K. See Budnikov, P. P.

Tadokoro, Y. On thermal properties of refrac. at high temps., A (7) 159.
Taggart, A. F., and Gaudin, A. M Surface tension and adsorption phenomena in flotation, A (11) 268.
Tait, W. J. Safety locking device for filter press., A (9) 202.
Takahashi, R. Elastic cement, P (6) 121.
Takahashi, S. Cracking and corrosion of glass pots, A (11) 245; Temp. in pot fur., A (7) 151.
Takamatsu, T., and Kuwayama, M. On refractory cement, A (11) 254.
Takita, I., and Wataya, M. Utilization of a waste alumina, A (11) 269.
Tammann, G. Constitution of silicates, A (9) 210.
Tammann, G., and Pape, W. Silica studies. I. Loss of water of kaolin and its behavior in solid condition toward carbonates and oxides of alkaline earths, A (11) 266.
Tanaka, H. Isolation of alumina from clay, P (6) 138.
Tauber, A. How flower pots are manufd., A (2) 22.
Taylor, M. A. Prob. of continuous kiln burning, A (7) 166.
Taylor, R. L. Bldg. brick and process of making same, P (11) 240.
Taylor, T. S. Stimulating research by organization, A (3) 46.
Taylor, W. C. Glass, P (3) 64; P (7) 155; Glass, P (7) 155; Glass compn., P (6) 126; Glass and process of making same, P (8) 178.
Taylor, W. C. See Sullivan, E. C.
Tefft, C. F. Darlington Clay Products Co. II, A (10) 222; Equipment and methods used at Darlington Products Co., A (7) 156–57.
Teisen, T. Fur., P (12) 286; Improvements in the design of recuperative glass pot fur., A (6) 123.
Tenen, H. T. Classifying and measg. color by the Ostwald method, A (6) 120.
Testrup, N. China clay, P (7) 170.
Thatcher, H. S. Plaster or cement, P (7) 148.
Theisen, T. Treatise on the design of pot arches, A (12) 275.
Thiele, R. Continuous fur. for burning cement, P (9) 194.
Thomas, W. See Rideal, E. K.
Thompson, E. A., and Sadler, A. Chem. and phys. characters of bentonite, A (10) 229
Thompson, J. G Prelim. study of zirkite ore, A (5) 111.
Thomson, E. Fused quartz, silica glass or fused quartz, A (7) 152.
Thorvaldson, T. Effects of alkali on concrete in prairie provinces, A (2) 33.
Tiffany, L. L. Viscosimeter, P (2) 10.
Tillyer, E. D. See Wells, J. C.
Tippmann, F. Detn. of the suitable fineness of grinding of mat. used in the manuf. of cement, A (11) 239; The fine grinding of cement raw mix, A (11) 239.
Travers, M. W. Casing of opal on flint glass, A (2) 26; Clouding of table-working glass tubing

in blowpipe flame, A (3) 59; Ht. balance of plant consisting of air-steam gas producer and glass tank fur., A (3) 59.
Treat, F. H. Gas producer, P (12) 286.
Treischel, C. C. Porcelain, P (3) 55; P (10) 226.
Trillich, H. Color designation, A (4) 70; A (11) 236.
Trinks, W. Ht. balances of blast fur. and steel plants, A (3) 46.
Troland, L. T. Rept. of Comm. on colorimetry for 1920–21, A (2) 8.
Tschoplowity, F. Thermal capacity of bricks, A (9) 197.
Tucker, G. M. Effect of nickel salts on color, A (8) 183.
Tumura, G. Brick, B (7) 162.
Turner, E. Symposium on casting, A (12) 282.
Turner, W. E. S. Brit. glass indus.; its development and outlook, A (5) 93; A (10) 218; Casing of opal on flint glass, A (2) 26; Causes of secondary boil, A (2) 27; Critical examn. of methods commonly used in detg. durability of glass, A (3) 60; Glass industry, A (3) 58; Glass and metal, A (5) 92; Heat resisting glasses, A (6) 125; A (7) 149, A (10) 218; Influence of saltcake on decolorizing action of selenium, A (2) 27; Specif. in the Brit. glass indus., A (12) 275.
Turner, W. E. S., and Cousen, A. Production of colorless glass in tank fur., A (6) 124.
Turner, W. E. S., Dimbleby, V., and Dickenson, A. W. Mixing of batch, A (6) 123.
Turner, W. E. S., and Hodkins, F. W. Some difficulties of the interpretation of autoclave results, A (5) 92.
Turner, W. E. S., and Wilson, T. E. Action of various analytical reagents on chem. glassware, A (2) 27; Action of various analytical reagents on chem. glassware, A (3) 60.
Turner, W. E. S. See Cousen, A.; See Dickenson, A. W.; See Dimbleby, V.; See English, S.; See Hodkin, P. W.
Twyman, F. App. for controlling annealing of glassware and annealing without pyrometers, A (3) 60.

Uchida, T., and Arimoto, K. Study of acid-resisting enamels, A (11) 240.
Ueda, K. See Hagiwara, K.
Unger, M. Linings for induction fur., P (2) 21.
Urban, W. See Berl, E.
Uyeda, J. Study of translucent hard-faience glaze, A (7) 164.

Valentine, I. R. Elec. fur., P (10) 227.
Van Dusen, M. S. Simple app. for comparing the thermal condy. of metals and thin specimens of poor conductors, A (5) 113.
Van Marle, M. Continuous annealing fur., P (3) 64.
Van Nieuwenburg, C. J. Thermo-resistant glass, P (11) 248.
Ver Mehr, J. Building brick, block and the like, P (12) 281.
Vernon, H. M. Atmospheric conditions in potters' shops and efficiency of various types of drying stoves, A (6) 133.
Visser, C. K. Weathering of Belgian bricks, A (2) 7.
Vitali, G. New elec. fur. of Fiat works; New steel elec. fur. of Fiat works, Turin, A (2) 19.
Vogel, O. Pickling bath for iron, P (11) 242.
Vogt, J. H. L. Phys. chemistry of the crystn. and magmatic differentiation of igneous rocks, A (5) 107.
Vosmaer, A. Elec. pptn. of dust, A (2) 8.

Wadsworth, C. The 12-hr. shift, A (2) 5.
Waeser, B. Commercial electro-thermic process, A (5) 117; Tech. thermoelec. process, A (2) 19.
Wagner, W. F. Masonry structure, P (7) 158.
Walker, T. L. Development of mineralogical methods, A (8) 188.
Wallace, A. M. Largest brick plant in the world, A (5) 114.
Wallace, F. S. Method and means for handling and hacking bricks, P (12) 281.
Walther, K. Formation of emery observed at an occurrence of corundum rock in Uruguay, A (10) 225.
Wang, G. Scien. aspects of China's ancient pottery indus., A (6) 134.
Ward, H. See Goucher, F. S.
Warga, K. Enameling, P (12) 274.
Warren, J. A. Crushing and grinding mach., P (9) 208.
Warrin, E. Metallic decorations on china or glass, P (6) 126.
Washington, H. S. Chem. anal. of rocks, B (5) 114; Chemistry of the earth's crust, A (5) 107.
Wataya, M. See Takita, I.
Watson, J. Cements and artificial stone, B (5) 92.
Wattebled, M. F. Firing of bldg. brick in Hoffmann kilns, A (11) 251.
Watts, A. S. Factory prepn. and burning of whiteware bodies, A (2) 22.
Weber, B. F. Method of and means for making bricks, P (9) 196.
Wedgwood, P., and Hodsman, H. J. Detn. of volatile matter in fuels, A (6) 139.
Weed, J. M. New induction fur., A (5) 100.
Weeks, L. System of kilns, P (9) 200.
Weigel, O. The prob. of the combination of water in zeolites, A (12) 287.
Weigel, W. M. White clay indus. in vicinity of Langley, S. C., A (2) 14; A (3) 54.
Weller, H. O. Sand-lime bricks, A (2) 33.
Welles, C. E. Fire-resisting compn., P (6) 140.
Wells, J. C., and Tillyer, E. D. Antaeus glass, P (8) 177.
Wentzel, C. E. Fur. gas producer, P (8) 187.
Wescott, H. P. Measurement of gas and liquids by orifice meter, B (5) 105.
West, C. J. Fine and research chem. A (11) 266.
Westman, A. E. R. Reln. between current, voltage, and length of carbon arcs, A (8) 185.
Wetmore, M. P. Glass-blowing mach., P (8) 177.
Whatmough, W. A. Reannealing of glass, A (3) 60.
Whitby, B. R. Molding and coloring artificial stone, P (3) 68.
White, C. A. Refractory compn., P (3) 53.
White, G. N. Chem. procelain, A (6) 133; A (11) 258.
Whithey, W. H. Some criticism of the use of the autoclave as method of testing glassware, A (5) 92.
Whittemore, J. Drawing sheet glass, P (7) 155; Method and app. for drawing and flattening sheet glass, P (12) 277.
Wikoff, A. G. Manuf. and application of lightweight concrete slabs, A (11) 238; Fire clay

refrac., A (2) 15; Manuf. of fire clay refrac., A (2) 15.
Wilcox, A. C. Gathering and delivering app. for molten glass, P (11) 249.
Wilhelm. Estn. of hydrogen in producer gas, A (12) 287.
Willett, A. H. Fire-brick arch, P (11) 257.
Willetts, H. G. Glass-melting tank, P (11) 248.
Williams, G. A., and Ferguson, J. B. Diffusion of hydrogen and helium through silica glass and other glasses, A (2) 14.
Williams, W. D. Light metal alloys for pistons, A (3) 50.
Wilson. See Baillie.
Wilson, A. W. G. Sask. clays and new indus., A (10) 229.
Wilson, G. V. Bauxite clay (Ayrshire), A (2) 11; Barytes and witherite, A (5) 105.
Wilson, H. Our ceram. family, A (10) 229.
Wilson, T. E. See Turner, W. E. S.
Winchell, N. H., and A. N. Elements of optical mineralogy, B (5) 108.
Winder, S. E. Glass mfg. mach., P (4) 74.
Windett, V. Gas producers and producer gas, A (6) 139.
Winslow, C. E. A. Health problems of indus., A (8) 175.
Wirrer, G., and Moyer, A. C. Scleroscope, P (6) 136.
Withey, W. H. Use of the autoclave test as a method of testing glassware, A (12) 277.
Witt, J. C. Effect of sulfur compd. on cement, A (3) 65; Function of lab. in cement manuf., A (3) 65; Some generalizations on the influence of subs. on cement and concrete, A (3) 65.
Wolbach, M. O., Jr. See Bingham, E. C.
Wolever, F. H. Pulverizing mill, P (12) 286.
Wolfe, H. G. Importance of grinding, A (2) 5.
Wollaston, T. R. Filtration, B (5) 117; Some developments in gas producers, A (8) 185.
Wood, R. F. Smelting silica bricks with reverberatory slags in a copper blast fur., A (7) 161.
Woodson, J. C. Ht. insulating mats. for elec. heated app., A (5) 104.
Worcester, W. G. Ceram. work, A (12) 289; Saskatchewan clays, A (4) 82.
Wright, F. See Moore, W. E.
Wright, W. J. Oil shade, A (4) 81.
Wyatt, J. R. Induction fur., P (6) 132.
Wyatt, J. R. See Clamer, G.
Wyer, S. S. Smithsonian Institution's Study of Natural Resources applied to Pennsylvania's Resources, B (5) 108.

Yamamoto, R. Magnesia plaster, P (6) 122.
Yamamoto, T. Continuous cooling fur. for glass vessels, P (6) 126.
Yanaka, R. See Mano, N.
Yashore, Tamotsu. Rept. of expts. with gas-producer, A (3) 44.
Yokoi, I. Process of mfg., P (3) 57.
Yoshioka, T. Glass, P (7) 155.
Yoshizaka, S. See Shinagawa, Y.
Young, G. J. Manganese dioxide produced by chem. process in Calif., A (6) 139.
Young, J. M. Glass-blowing mach., P (10) 221; Take-out and delivery device for glass blowing mach., P (10) 221; Take-out and steadying device for glassblowing mach., P (10) 221.

Zander, H. See Siemens, H. von.
Zakharoff, A. A. Building drier over kiln, A (5) 97.
Zeh, E. W. Power tile press., P (9) 203.
Zschimmer, E. Natural constants and tech. constants of glasses, A (2) 28.
Zulauf, R. Enamel-coated writing tablets, P (6) 122.

SUBJECT INDEX TO ABSTRACTS

Abraded glass surfaces, structure of, A (2) 30.
Abrasive, aluminous, P (12) 272.
articles with glue as binder, P (12) 272.
grinding wheel test device, P (8) 172.
safety tread tile, P (6) 120.
wheel, segmental, P (12) 272.
Abrasives, aluminous, process of mfg., P (8) 172.
app for testing, P (6) 136.
artificial corundum, P (3) 54.
and polishing powders for glass, A (2) 29; A (7) 152.
a statistical review, A (2) 21.
Absorption test on common brick, A (3) 55.
Accelerated test, disintegration of cement in, A (3) 66.
Acceleration of vulcanization, P (10) 230.
Accelerators, process for making vulcanization, P (7) 170.
Acid elec. fur. practice, A (2) 18.
proof cements, A (11) 238.
resisting enamels, A (11) 240.
Acidic reaction of Japanese acid clays, A (11) 266.
Adsorbent properties of clays, A (11) 267.
Ajax-Wyatt in brass fur. mill casting shop, A (5) 100.
Alca cement, A (8) 175.
Alkali, effects of concrete in prairie provinces, A (2) 33.
fluorides, vapor press. of, A (2) 13.
lakes of Texas, A (9) 209.
metal silicate, manuf. of, P (11) 265.
production in blast furn., P (3) 64.
Alumina, effect of in retarding devitrification of glass, A (6) 123.
and ferric oxide sepd. from lime, A (5) 109.
isolation from clay, P (6) 138.
from low grade bauxite clays, P (3) 54.
refrac., P (6) 132.
utilization of waste, A (11) 269.
Aluminium, A (2) 12.
hydroxide and aluminic acid, A (2) 14.
manuf. of in Russia, A (5) 90.
ores in Hungary, A (2) 13.
Aluminous abrasive and method of making, P (12) 272.
cement, A (5) 91.
Aluminum chloride, app. for manut. of, P (12) 272.
Alunite, chemistry of, A (2) 12.
shales, aluminium from, A (2) 12.
treating, P (11) 256.
Analysis of bubbles in glass, A (8) 176; A (12) 276.
of mine and car samples of coal collected in 1916–1919 incl., A (2) 5.
and purification of zirconium oxide, A (5) 111.
quantitative, of clays, A (5) 110.
rapid detn. of potash, A (7) 169.
estn. of iron and alumina in clays, A (9) 211.
rational, centesimal use of microscope, A (8) 188.
of rocks, etc., rept. from chem. lab. of the Royal Hungarian Geol. Sur., A (2) 14.
sepn. of iron and alumina from lime, A (5) 109.
of silicates, phys. chemistry of thermo-decompn., A (12) 287.
simple method for the estn. of soda content in potash, A (2) 13.
sulphate, chloride aud carbonate radicals in soda lime glasses, A (11) 265.
tested methods of non-ferrous metallurgical, A (5) 114.
Analyzing flue gases, app. for, P (6) 136.
Anhydrite as bldg. mat., A (2) 32.
Annealing fur., continuous, P (3) 64.
of glass, A (3) 60; A (3) 62; A (10) 217.
glassware without use of pyrometic app. for, A (3) 60.
and ht. treatment of gage glass, A (2) 28.
a modern cycle, A (5) 96.
temps. of boro-silicate glass, effect of boric oxide on, A (12) 275.
Antaeus glass, P (8) 177.
Antimony oxide, color given to glass, A (11) 244.
yellow glazes, A (5) 103.
Apparatus, elec. htg. and controlling for small thermostat, A (2) 7.
for meas. high temp., A (2) 9.
a new thermo-regulator for the thermostat, A (2) 8.
refractometer for detn. of solid and liquid subs., A (2) 8.
a simple, for testing refractive indices of liquids, A (2) 9.
Arch brick, P (11) 257.
Architecture, ceram. in the field of, A (6) 120.
Architectural pottery process of mfg. rough surfaced, P (3) 57.
Arsenic, v. p. of, A (9) 210.
Art, the application of self-luminous colored decorations, A (3) 63.
and its application to the pottery indus., A (6) 120.
glass paintings, processes and methods of medieval, A (6) 124.
Artificial stone, mat. for, P (3) 67.
molding and coloring, P (3) 68.
Asbestos cement, P (3) 67.
Autoclave test for durability of glass, some aspects of, A (12) 277.

Ball clays, Amer. and English, A (5) 101.
properties of some, A (2) 24.
Ball and pebble milling for pulverizing and mixing, A (2) 3.
Barium, rocks rich in, A (2) 11.
and strontium silicates of, A (4) 83.
Barytes, occurrence, mining uses, A (6) 139.
standardization of test, A (5) 110.
and witherite, A (5) 105.
Bauxite, A (7) 168.
Ayrshire, A (2) 11.
clays, alumina from low grade, P (3) 54.
deposits of Italy, A (4) 81.
dissociating, A (10) 214.
European products, A (8) 181.
kaolins, clays, loss on ignition and porosity of, A (4) 83.
and limestone used in Alca cement, A (8) 175.
occurrence, mining and uses, A (6) 128.
practical anal. of, A (9) 211.
preliminary rept. on occurrences in N. Bihar, A (2) 15.
production of, A (10) 214.
refrac. with bentonite, P (6) 132.
used in fast hardening cement, A (7) 145.
Bentonite, bond for bauxite refrac., P (6) 132.
chem. and phys. character of, A (10) 229.
in spark plug insulation, P (4) 77.
used in de-inking of paper, A (3) 44.
Beryl, component of porcelain, P (10) 226.

in elec. porcelain, P (3) 55.
use of in porcelains, P (3) 51.
Bifocal lens blanks, app. for manuf. of, P (8) 177.
Binary systems, of Na_2WO_4–Na_2SiO_4, A (2) 36.
Bituminous sands, A (5) 105.
Blasting, quarry, A (10) 229.
Block, bldg., P (10) 222.
Boiler house, cause and prevention of smoke in, A (2) 4.
Boilers, application of pulverized coal to, A (2) 7.
Borax and boric acid, process for the manuf. of, P (8) 189.
Boric oxide, anal. of glasses rich in, A (12) 275.
glasses, a study of the melting and working properties of, with special ref. to the boro-silicates, A (12) 275.
influence on annealing temps. of boro-silicate glasses, A (12) 275.
Boro-silicate glass, improvement in, P (3) 63.
in ovenware, P (8) 176.
Brass wts., protection of, A (5) 116.
Brick, absorption test of common, A (3) 55.
app. for transporting and unloading, P (4) 78.
bldg. block and construction, P (9) 197.
bldg. mats. in Czechoslovakia, A (12) 280.
block and the like, P (12) 281.
burning with electricity, A (5) 105.
channel, P (8) 180; P (11) 254.
clay flux for, P (6) 128.
products in Ger., A (7) 157.
clinker, A (10) 222.
common, making and marketing of, A (2) 24.
Darlington Clay Products Co., A (10) 222.
dies, construction and adjustment, A (9) 195.
drying, app. for, P (12) 281.
equipment and methods used at Darlington Clay Products Co., A (7) 156.
face, manual of construction, B (7) 159.
faced metallic trim, P (9) 196.
firing in Hoffmann kiln, A (11) 251.
for forges and annealing fur., A (3) 56.
for fur. construction, P (9) 209.
wall, P (11) 256.
of ground clinker, P (6) 122.
handling app., P (8) 180.
hollow wall, P (9) 197.
improvement in kiln for burning, P (7) 167.
indus., use of low grade fuels in, A (2) 7.
insulating, highly porous, A (12) 280.
interlocking, P (4) 75; P (4) 76.
kiln, P (7) 167.
lime, A (2) 32.
method of setting and burning, P (8) 181.
machine, P (9) 196.
microscopic structure of, A (11) 253.
plant, largest in world, A (5) 114.
at Vanport, Pa., A (6) 128.
prevention of efflorescence on, P (3) 57.
roads for Britain, A (6) 127.
salt glazing, A (6) 127.
sand face, manuf. of, A (11) 253.
sand lime, A (2) 33; A (12) 280.
manuf. of, A (2) 26.
specif. for in Austria, A (11) 252.
scum due to vanadium, A (3) 57.
shapes, method of molding, P (8) 182.
specif., A (7) 156.
surfacing mach., P (8) 180.
texture, method of forming, P (10) 222.
and tile in Dixie, A (10) 228.
mach. P, (8) 181.
mech. burning of, A (7) 166.
unloading kiln app. for, P (8) 179.
use of liparite in, P (7) 162.
use of waste slate, A (7) 156.
weathering of Belgian, A (2) 7.
white glaze for red burning clays, A (6) 126.
work, govt. specif. for all kinds of, A (10) 222.
Brickmaking app., P (8) 181.
in Czechoslovakia, A (9) 196.
Bricks, glazing, A (6) 128.
handling and hacking, method of, P (12) 281.
method for burning, P (7) 167.
and means for making, P (9) 196.
from oil shale, A (11) 251.
Brickworks, coal saving methods in, A (2) 2.
Briquettes, press for forming, P (8) 186.
British Columbia clay, A (5) 106.
a fossil resin from, A (5) 105.
Brown glass milk bottles, A (3) 59.
Bubbles in glass, anal. of, A (8) 176.
Building block, P (7) 158; P (10) 222.
construction, P (8) 180.
Bureau of Standards, A (4) 82.
Burner for fuel oil, P (9) 202.
Burning bituminous shale, A (6) 127.
brick with electricity, A (5) 105.
a downdraft kiln, A (2) 3.
effects, coloration, discoloration and other, A (5) 97.
of porcelain, A (4) 76.
roofing tile, A (3) 56.
in updraft kilns, A (5) 97.
of white wares and prepn. of bodies of, A (2) 22.

Calcareous clays, treatment of, A (7) 156.
Calcium chloride, effect of on strength of Port. cement, A (3) 66.
hydroxide in hardened Port. cement, A (11) 238.
sulfate, dissociation of at higher temps., A (8) 188.
Calite, a new alloy resistant to high temps., A (8) 185.
Calorimeters, P (3) 48.
Calorizing, application of to glass making processes, A (5) 96.
Canadian kaolin, A (5) 106.
Capillary pressure, flow of liquids under, A (5) 112.
Car dump, kickback, P (7) 159.
Carbon, amorphous, and graphite nature of, A (5) 99.
brick, A (2) 17.
dioxide recorder, A (2) 8.
elec., A (3) 47.
impregnated refrac., A (12) 282.
Carbonaceous refrac. for fur. walls, P (6) 132.
Carbonized brick, A (8) 182.
clay, a new refrac. mat., A (5) 101.
Carolina, South, white clay indus. in vicinity of Langley, A (2) 14.
Cast iron, growth of, A (2) 31.
Casting clay wares, A (7) 169.
porcelain tanks, P (9) 200.
symp. on, A (12) 282.
Casting of opal on flint glass, A(2) 26.
Catalysis in glass formation, A (10) 217.
Cement, and acid slags, the remelting of, A (3) 65.
Alca (Al + Ca), A (8) 175.
aluminous, A (5) 91.
asbestos, P (3) 67.
automatic vertical fur. for the baking of, A (4) 70.
behavoir of Port. under pure water, A (10) 215.

burning continuous fur. for, P (9) 194.
ht. efficiency increase in, A (2) 35.
as by-product of burning pulverized fuel, P (3) 67.
calcium hydroxide in Port., A (11) 238.
caustic magnesia, A (4) 70; A (5) 91.
chemically combined water in hardened, A (11) 238.
"ciment fondu" compared with Port., A (7) 145.
and clay tubing tests of, A (5) 98.
clinker, free, lime in, A (11) 238.
reagents used in etching for microscopic study, A (7) 143.
and concrete, vol. change of, A (2) 36.
Die Portland-zement fabrikation, B (7) 149.
disintegration of in accelerated test, A (3) 66.
dolomitic, the chemism of hardening, A (10) 214.
effect of sulphur compds. on, A (3) 65.
elastic, P (6) 121.
elec., A (3) 66.
fused aluminous, A (11) 239.
hardening, effect of low temp. on, A (10) 216.
hydraulic binding mat., A (10) 215.
increase in resist. to sea water by addition of trass, A (2) 36.
indus. in China, A (2) 35.
influence of calcium chloride on strength of, A (3) 66.
insulating, P (3) 53.
kieselguhr and gypsum, P (7) 148.
kiln insulation, A (5) 101.
system, P (11) 240.
kilns and fuel, A (2) 32.
measurement of the temps. of rotary, A (2) 35.
rotary, utilization of waste ht. from, A (2) 36.
thermochemistry of, A (2) 33.
utilization of waste ht. of, A (3) 66.
and lime, chem. reactions in the burning of, A (4) 71.
mortars, influence of hardening in steam under press., A (4) 71.
magnesia improvement in manuf. of, A (7) 148.
magnesium oxychloride, A (7) 147.
manuf., function of lab. in, A (3) 65.
of from marl, A (11) 239.
of Port., B (5) 91.
marble, P (3) 67.
mill, P (4) 78.
of Rumania, A (3) 66.
mixt. to withstand sea water, P (6) 121.
strengthening compn. for, P (6) 122.
oxychloride, P (3) 67.
paint for water proofing, P (3) 67.
pitch, P (3) 67.
plants, Italian, A (12) 272.
Port., defects in the manuf. of, A (2) 35.
effect of aeration on, A (7) 143.
tent. specif. and tests for, A (5) 90.
properties of Port., A (11) 239.
protection of against acids, A (10) 215.
quick setting, A (12) 273.
raw mix, fine grinding of, A (11) 239.
refrac. oxychloride, P (3) 53.
setting of, A (7) 146.
slag and dolomite, A (7) 144.
some generalizations on the influence of subs. on, A (3) 65.
storage and transportation of, A (3) 65.
structural mat. tested, A (2) 32.
suitable fineness of grinding mat. used in manuf. of, A (11) 239.
waterproof, A (6) 120.
hardening agent, P (8) 175.
Cements, acid proof, A (11) 238.
and artificial stone, B (5) 92.
dental, phys. properties of, A (7) 148.
fast hardening, A (7) 145.
of high hydraulic index, value of, A (3) 65.
high strength, A (2) 36.
limes and plasters, B (5) 92.
refrac., A (2) 20.
the setting and hardening, A (10) 214.
Centrifugal sieve, A (3) 48.
separator continuous, P (3) 49.
Ceramic bearing, fused, P (6) 134.
compn. of natural or artificial corundum, P (3) 55.
congress (French), A (10) 229.
firing in elec. fur., A (5) 105.
industries of N. A., importance of research in the development of, A (2) 5.
Sweden, A (7) 170.
replacing cast iron, A (12) 289.
wares of China, B (4) 86.
Ceram., Amer. trend of, A (12) 272.
Chinese, B (2) 38.
in the field of architecture, A (6) 120.
Chamotte, historical sketch, of use, A (6) 122
Channel brick, P (11) 254.
Chelsea porcelain, B (4) 84.
Chemical anal. of rocks, B (5) 114.
chemical constitution of silicates, A (2) 13.
engineering text book of, B (5) 114.
glass and hard glass, A (11) 247.
indus. in Amer., A (2) 7.
in Greece, A (3) 44.
and phys. properties of commercial lime, A (2) 34.
porcelain, A (6) 133; A (11) 258.
crucible, P (6) 134.
proof stoneware, A (10) 226.
relations of kaolinite at high temp., A (2) 13.
stoneware, unique development of modern, A (3) 54.
tent. specif. for limestone, quick and hydrated lime, A (5) 91.
ware, glass, P (3) 64.
Chemist and the plant manager, A (4) 83.
Chemistry of the earth's crust, A (5) 107.
wonder book of, B (5) 117.
China, early ceram. wares of, B (4) 86.
or glass, metallic decorations on, P (6) 126.
China clay, Cornwall, A (7) 169.
deposits in Malay, A (12) 286.
drying, P (7) 170.
English, A (2) 5.
in Quebec, A (2) 12.
Chinese ceram., B (2) 38.
Chromate-albumin copying process as an etching basis for glass, A (2) 30.
Chromite crucibles, P (11) 256.
and ferro-silicon refrac. for high temp. fur., P (6) 132.
the marketing of, A (6) 128.
Chromium, color imparted to glass, A (11) 243.
group, reduction of oxides of metals of, P (8) 189.
Clay brick compn. flux for, P (6) 128.
British Columbia, A (5) 106.
and cement tubing, A (5) 98.
china in Calif., A (10) 226.

microscopical examn. of, A (10) 226.
its properties, prepn. and use, A (7) 169.
in Quebec, A (2) 12.
dissociation of by lime, A (2) 10.
drying, P (3) 51.
handling with belt conveyors, A (9) 195.
mud, A (5) 109.
phys. properties of, A (5) 110.
pit, keeping water out of, A (2) 4.
purification of, A(2) 11.
red burning, white glazes for, A (6) 126.
refining P (3) 51.
shingle, block and wall construction, P (10) 223.
tests to detn. the uses of, A (3) 44.
treating, P (3) 51.
treatment of, P (8) 190.
with deflocculating agents, P (6) 138.
white, industry in the vicinity of Langley, S Car., A (2) 14; A (3) 54.
Clays, acidic reaction of Japanese acid clays, A (11) 266.
action of ht. on, A (6) 138.
adsorbent properties of, A (11) 267.
ball, Amer. and English, A (5) 101.
bauxite, Ayrshire, A (2) 11.
calcareous, treatment of, A (7) 156.
data on colloidal, A (2) 13.
formation of, A (2) 10.
high grade of the east. U. S., A. (3) 49; A (5) 108.
lime, working of, A (2) 26.
New S. Wales, A (10) 229.
origin of, A (11) 263.
pot, provisioned specif. for, A (5) 94.
quant. anal. of, A (5) 110.
Saskatchewan, A (4) 82; A (10) 229.
Cleaning crystal and glassware, compn. of matter for, P (8) 190.
Clinker brick, A (10) 222.
use of in bricks, P (6) 122.
Clouding of table-working glass tubing in blow-pipe flame, A (3) 59.
Coal, anal. of samples collected in 1916–1919, A (2) 5.
application to boiler of pulverized, A (2) 7.
ash fusibility by micropyrometer, A (6) 138.
distributors, A (11) 261.
elevators, a novel, A (11) 261.
m. p. of, A (11) 256.
powdered in the foundry, A (2) 6.
purchase specif. rational basis for, A (6) 139.
recent development of, A (5) 116.
saving methods in brickworks, A (2) 2.
in ceram. plants, A (12) 289.
Coals, Ohio, gasification of, A (5) 116.
Cobalt compds., coloring glasses with, A (7) 151.
Coke oven, refrac. for, A (2) 18.
walls, destruction of, A (9) 198.
Colloid chemistry, a bibliography, B (6) 140.
chemistry, application to mineralogy and petrology, A (5) 112.
general and indus. applications, A (5) 110.
lab. manual of, B (2) 40.
Colloid in clays effect of, on phys. properties of clays, A (5) 110.
mill and the ultra-filter press, A (5) 105.
particles, deposition of, from a soln. by means of an elec. current, A (4) 82.
Colloidal clay, A (12) 287.
clays, data on, A (2) 13.
systems in solid cryst. media, A (5) 114.
Colloids, the science of, A (2) 6.
Color, chromium, in glass, A (11) 243.
classifying and measuring by the Ostwald method, A (6) 120.
designation, A (4) 70; A (11) 236.
effect of nickel salts on, A (8) 183.
given to glass by tungsten, A (11) 242.
of iron oxides, A (2) 14.
manganese compds. in glass, A (11) 243.
meas., expts. on, A (11) 236.
research during 1922, record of, A (11) 236.
what progress the new science of has brought, A (3) 46.
Coloration, discoloration and other burning effects, A (5) 97.
and fluorescence of glass produced by β rays, A (8) 176.
Colored decorations, self-luminous, the application of in the glass and ceram. indus., A (3) 63.
glazes in the ceram. indus., A (8) 172.
Colorimetry, rept. of Comm. on, A (2) 8.
Coloring glass with nickel, A (3) 58.
glasses with cobalt compds., A (7) 151.
molybdenum on glass, A (11) 243.
process of underglaze, P (3) 55.
Colorless glass, manuf. of in a tank fur., A (10) 218.
production of with particular ref. to the use of selenium, A (5) 94.
production of, in tank fur., A (6) 124.
Colors, decorating table glassware in, A (6) 122.
mineral, A (2) 11.
Combustion ht. of and work of dissociation, A (4) 79.
Component system lime, silica and alumina, A (11) 268.
Concentrator, ore, P (11) 261.
Concrete construction, new system of, A (2) 32.
effect of alkali on, A (2) 33.
Concrete lined pipes, A (12) 273.
Conductivity, thermal, of liquids, insulators and metals, meas. of, A (2) 8.
Conservatoire Nationale des Arts et Métiers, Paris Ceram. Lab., A (12) 289.
Constants, natural and tech. of glasses, A (2) 28.
Continuous kilns, use of hot air in, A (2) 4.
Control of works operations by scien. instruments, A (5) 117.
Conveyors, belt, clay handling with, A (9) 195.
Copiapite, A (3) 49.
Copper ruby glass, A (3) 62.
Corrosion in economizers, A (2) 4.
prob. of retarding, A (4) 82.
Corundum, artificial, P (3) 54.
bearing rocks, the prochlorites of, A (10) 225.
in India, A (2) 21.
natural or artificial for ceram. compn., P (3) 55.
rock in Uruguay, A (10) 225.
Crazing of English earthware, A (6) 133.
Creative impulse in indus., B (2) 37.
Crusher steel improvement in suggest by metallographic tests, A (9) 202.
Crushers gyratory, A (2) 33.
Crushing and grinding mach., P (9) 208.
laws of, A (9) 211.
mach., P (9) 203.
strength of concrete and propn. of its mat., A (11) 238.
Crystal glazes with uranium, A (7) 142.
Crystalline alumina, graphite, fused silica and silicon carbide, refrac. compn., P (10) 226.
Crystallization and magmatic differentiation of igneous rocks, the phys. chemistry of, A (5) 107.

Crystallizing glass walls by rubbing with glass rods, A (2) 28.
Cullet, best ratio of cullet to, A (5) 93.

Damproofing concrete body, P (4) 84.
Darlington Clay Products Co., A (10) 222.
Decorated glass beads, A (5) 93.
Decorating ceram. articles, metallizing, P (8) 174.
ceram. ware fur. for, P (12) 285.
firing fur. or kiln, rapid, P (8) 185.
pottery, tool for, P (8) 184.
table glassware in colors, A (6) 122.
Decorations on china or glass, metallic, P (6) 126.
Definitions, relating to hollow tile, A (5) 97.
Dehydrating solid subs., app. for, P (4) 78.
Density of soda-lime magnesia glasses, A (10) 219.
Dental cements, phys. properties of, A (7) 148.
Devitrification caused upon the surface of sheet glass by ht., A (6) 124.
of glass, effect of alumina on, A (6) 123.
Diatomaceous earth, Canada, A (10) 230.
deposits, A (5) 106.
in Islands of Oki, A (11) 264.
manuf. and uses of, A (5) 106.
Dies, construction and adjustment, A (9) 195.
Diphasic nature of glass, A (11) 247.
Discoveries of the twentieth century, B (5) 117.
Dispersion formulae and the secondary spectrum, A (2) 29.
Dispersoid chemistry of gypsum, A (2) 36.
Dissociating bauxite laterite and argillaceous subs., A (10) 214.
Dissociation of calcium sulfate at higher temps., A (8) 188.
of clay by lime, A (2) 10.
Distillation treatment of shales, P (8) 190.
Dolomite, A (6) 129.
chem. study of, A (10) 225.
limestones and similar carbonates, characteristics for the evaluation of, A (5) 91.
and slag cement, A (7) 144.
studies on the system, A (10) 225.
theory of the formation of, A (3) 50.
utilization of, A (9) 199.
Dolomitic cements, the chemism of the hardening of, A (10) 214.
Draft, induced device, P (11) 263.
resist. to and progression of the fire in annular kilns, A (2) 7.
in rotary kilns, A (11) 261.
Draught, forced *vs.* natural, A (9) 208.
Drier over kiln, bldg., A (5) 97.
recirculation uses little power, A (12) 283.
Dry pressing refrac. shapes, A (5) 99.
Drying, and air humidity, A (7) 170.
brick app. for, P (12) 281.
clay, P (3) 51.
and conditioning mat., method of and app. for, P (12) 285.
mat. by steam and air currents, app. for, P (6) 136.
oil fuel for, A (9) 211.
plant, vacuum, A (4) 84.
stoves, efficiency of various, A (6) 133.
thin plates or other ceram. articles, app. for, P (3) 48.
Durability and compn. of glass, an extension of Zulkowski theory of reln. between, A (3) 61.
Dust, elec. pptn. of, A (2) 8.
a new instrument for sampling aerial, A (4) 77.
pptn., elec., P (3) 47.
Dynamometer for hardness testing, A (6) 135.

Economizers, corrosion in, A (2) 4.
Education, old style, an editorial, A (12) 289.
Efflorescence on bricks, prevention of, P (3) 57.
on ceram. products, A (12) 288.
due to vanadium, A (3) 57.
Elastic cement, P (6) 121.
Electric arc fur. adapted for melting zinc, P (2) 20.
blast fur., reducing ores in, P (2) 21.
cement, A (3) 66.
ceramic insulating mat., A (6) 131.
conductors, sealing of in glass, P (3) 63.
dust pptn., P (3) 47.
furnace, A (2) 19; P (9) 207; P (11) 261.
adapted for htg. crucibles and ceram. articles P (3) 53.
adapted for ht. treating metals, P (2) 20.
Ajax-Wyatt fur. in brass-mill casting shop, A (5) 100.
app. and method of operg. the same, P (12) 285.
arc, P (6) 135.
arc of the rocking types, P (6) 135.
arc type, P (12) 285.
calite, a new alloy resistant for high temps., A (8) 185.
design, principles of, for high temps., A (2) 19.
at the Fiat Works, A (2) 19.
fused aluminous cement, A (11) 239.
for high temp. melting, A (5) 100.
induction, A (5) 100.
inductive, P (6) 135.
line insulator, P (12) 285.
for melting quartz glass, A (11) 240.
melting refrac. for, A (3) 52.
method and device for htg., P (8) 186.
method of handling mat. in A (7) 166.
Moore, P (6) 131.
a new French type, A (4) 79.
opern. basic, A (2) 19.
opern. in metal refining, P (2) 20.
for ore reduction, P (2) 20.
practice, acid, A (2) 18.
practice, brass, A (7) 161.
recent developments, A (9) 198.
resist., P (6) 136; A (6) 137.
resist. crucible, P (6) 135.
resistor, P (9) 205; P (9) 206.
rotating or oscillating, P (6) 136.
steels, manuf. of, A (4) 79.
tilting arc crucible, P (6) 135.
on trunion axes, P (7) 166.
tubular resist., P (6) 135.
wall construction, P (9) 205.
furnaces, Fiat, A (4) 80.
firing ceram. wares in, A (5) 105.
present status of, A (4) 80.
refrac. for, A (3) 52.
status of, A (4) 80.
for steel, A (3) 52.
tech. thermoelectric process, A (2) 19.
glass fur., A (8) 175.
heat, its generation propagation and application to indus. processes, A (3) 46.
heating and controlling app. for small thermostat, A (2) 7.
indus. development for low temps., A (3) 64.
induction fur., P (3) 53.
linings for, P (2) 21.

insulating mats. Rept. of Comm. C-9, A (5) 104.
pptn. of dust, A (2) 8.
radiation fur., glass manuf. with, A (5) 95.
resist. fur., P (4) 81; P (9) 205.
for melting brass or copper, P (2) 20.
terminal for, P (9) 203.
steam generator, A (5) 115.
steel fur., htg., A (8) 185.
vacuum fur., molybdenum resist., A (5) 113.
Electrical carbon dioxide recorders, A (3) 47.
flue gas examiner, A (2) 8.
insulating compn., P (3) 47.
insulation, porcelain for, A (11) 258.
insulator, P (8) 184.
porcelain, A (2) 23.
manuf., some notes on, A (8) 184.
modern handling methods in the manuf. of, A (3) 55.
production of, A (9) 199.
precipitation of suspended particles from gases, P (4) 78.
properties of flint glass of d. 6.01, A (9) 195.
of silica acid sols., an invest. of, A (3) 50.
resist. mat., P (3) 53.
resistivity at high temps., A (2) 18.
Electrically heated ceram. ware, P (6) 134.
fur., the firing of ceram. products in, A (3) 45.
melted gray iron, A (4) 79.
reheating of glass, A (7) 153.
Electricity, burning brick with, A (5) 105.
Electrode protector telescoping, P (9) 205.
Electrodeposition of silver and copper on glass, A (11) 246.
Electrodes, app. for moving, P (9) 206.
pilot light control of, A (4) 80.
Electrolytes, effect on plastic clays, A (5) 108.
Electrolytic migration of sodium through glass, A (4) 72.
Electroösmosis of clays, A (6) 138.
commercial application of, A (5) 116.
Electrothermic processes, commercial, A (5) 117.
Elutriation, of clay and kaolin, P (12) 290.
the grading of powders by, A (3) 47.
Elutriator for rapid use, A (2) 9.
Emery, formation of observed at occurrence of corundum rock in Uruguay, A (10) 225.
indus. (Greece), A (10) 214.
papers, improvement of, A (5) 90.
wheel, glass shield for, A (4) 70.
Enamel, acid resisting study of, A (11) 240.
cast iron, A (11) 241.
cleaning, A (6) 122.
coating ceram. wares, P (7) 170.
effect of on transmission of ht., A (11) 242.
pickling bath for iron, P (11) 242.
removing from old and new articles, process of, P (12) 274.
rust, removing from metals, P (11) 242.
something better in smelters, A (3) 64.
Enameled app. for chem. purposes, standardization of, A (2) 31.
chem. wares standardization of enamels for, A (2) 31.
coated writing tablets, P (6) 122.
Enameling, P (2) 32.
color decorations on aluminum, P (12) 274.
the development of indus. elec. htg. for low temp., A (3) 64.
fur., P (3) 65.
furnaces, charging app. for, P (12) 274.
Enameling, method of, P (7) 149.
oven, P (7) 149.
spraying by means of gases under pressure, P (3) 65.
Enamels, correct notions on fluoride, A (11) 242.
Enamelware protector, P (8) 175.
English china clay, A (2) 5.
Etch or tarnish glass surfaces, A (2) 28.
Etching, the chromate-albumin copying process as basis of, A (2) 30.
compd. yellow, A (2) 23.
of glass, A (11) 245.
glass, note on, A (5) 96.
Excavating mach., P (8) 186.
Expansion coeff. of refrac., A (7) 159.
of glasses, anomalies in, A (6) 125.
of silica brick in coke oven, A (2) 16.
Expansion low coeff. glass, P (3) 64.

Faience, translucent hard glaze for, A (7) 164.
Fans, data for, A (2) 2.
Feeder and mixer, percentage, P (11) 260.
Feldspar, Canadian potash, A (6) 137.
high potash, Canada, A (4) 81.
a new process for utilizing, A (2) 11.
the phys. properties of hard porcelain caused by varying from sodium to potash, A (5) 102.
potash, melting of, A (3) 61.
Feldspars, chem. constitution of, A (2) 12.
Ferric oxide and alumina sepd. from lime, A (5) 109.
Fe_2O_3–SO_3–H_2O system of, A (2) 14.
Fiat electric fur., A (4) 80.
and steel fur., A (4) 80.
Fibrous wall board, P (7) 149.
Film method for measg. surface and interfacial tension, A (5) 112.
Films, the spreading of liquids and the spreading coeff., A (5) 113.
thickness of liquid formed on solid surfaces under dynamic conditions, A (5) 113.
Filter press, continuous for ceram. slips, A (12) 284.
development of, A (4) 77.
safety lock for, A (9) 202.
ultra, and colloid mill, A (5) 105.
Filter presses, standardization of, A (3) 54.
Filtration, B (5) 117.
Fire arch for fur., P (8) 182.
brick arch, P (11) 257.
disintegration, A (10) 223.
making stiff mud, A (10) 223.
clay refrac., A (2) 15.
manuf. of, A (2) 15.
resisting compn., P (6) 140.
Firing of ceram. products in elec. heated fur., A (3) 45.
ceram. wares in elec. fur., A (5) 105.
and the ht. economies in tunnel kilns, A (2) 4.
low temp. of porcelain, A (11) 258.
Flashing, fire, A (5) 97.
Flocculation meters, kinetic, A (2) 99.
Flotation, surface tension and adsorption phenomena in, A (11) 268.
Flower pots, how manufd., A (2) 22.
Flue-gas, elec. examiner, A (2) 8.
Fluidity, surface tension and reaction temps., method of calcg., A (4) 83.
Fluorescence and coloration of glass produced by β rays, A (8) 176.
Fluorides, alkali, vapor press of, A (2) 13; A (4) 82.
Fluorspar mining in the Western states, A (11) 264.
sources of, A (4) 81.

Flux, for clay brick compn., P (6) 128.
Formation of clays, A (2) 10.
Formulas, Henley's twentieth century recipes and processes, B (2) 41.
Foundry practice, American and British, B(5) 101.
Froth flotation, sepn. of graphite by, A (4) 77.
Fuel, the dangers of powdered, A (3) 45.
  gas valuation, new diagrams for, A (11) 268.
Fuel, liquid, burner, P (9) 206.
  oil, burning of porcelain with, A (12) 283.
    operg. continuous glass fur. with, A (5) 95.
    use of in the clay indus., A (12) 288.
    use of for finishing glassware, A (5) 95.
  powdered coal in steam plants, A (5) 116.
  producer gas for the glass indus., A (3) 62.
Fuels and cement kilns, A (2) 32.
  detn. of volatile matter in, A (6) 139.
  the use of low grade in the brick indus., A (2) 7.
Fuller's earth, adsorption and catalysis in, A (3) 49.
  process of giving form to, P (3) 51.
Fulweiler, Walter H., awarded Grasselli Medal, A (3) 46.
Furnace, cooling chamber for, P (12) 286.
  crucible for glass, P (2) 31.
  for decorating ceram. ware, P (12) 285.
  gas producer, A (2) 5.
  glass, P (2) 31.
  grate with brick inserts, P (10) 228.
  for high temp., A (9) 202.
  muffle, P (6) 137.
  partition wall, P (11) 256.
  roof, suspended, P (8) 183.
Furnaces, (see elec.)
  contg. melting pots or crucibles, P (3) 64.
Fusibility of Zettlizer kaolin, effect of U_3O_8 upon A (5) 110.

Gage, glass prob., A (3) 62.
  glasses, testing of, A (3) 62.
Gas analyzing app., P (3) 49.
  coal, app. for scrubbing, P (6) 140.
    collecting main and ascension pipe, P (4) 81.
  cocks, standardization of, for laboratories, A (4) 77.
  fired pottery kiln, P (3) 53.
  flue and fuel, new diagrams for valuation, A (11) 268.
  producer, P (4) 81, P (7) 168, P (12) 286.
    fur., A (2) 5; P (8) 187.
    ht. balance, A (11) 240.
    ht. balance of a plant consisting of a, and a glass tank fur., A (3) 59.
    practice in glass indus., A (9) 195.
    report of expts. with, A (3) 44.
    some developments in, A (8) 185.
  producers, automatic governor for, P (6) 139.
    and producer gas, A (6) 139.
    theory of and its application to blast fur. opern., A (3) 46.
    and vertical retort, P (6) 139.
  scrubber and fume arrested, P (4) 78.
  tables and charts for natural gas users, A (2) 5.
  water, air preheating with for small indus. fur., A (4) 79.
  works, use of refrac. in, A (9) 199.
Gases, elec. pptn. of suspended particles from, P (4) 78.
  specific heat of, A (2) 14.
Gasification of Ohio coals, A (5) 116.
Gels, the forms of gas and liquid cavities in, A (3) 50.
Geology, prob. in, of service to ceram., A (11) 263.
Gilding glazed clay vessels, A (8) 174.
Glass, abrasives and polishing powders for, A (2) 29; A (7) 152.
  addition of $MgBr_2$ to illuminate greenish color, P (3) 64.
  alkali metal silicate production in blast fur. suitable for, P (3) 64.
  anal. of, rich in boric oxide, A (12) 275.
  annealing of, A (3) 62; A (10) 217.
    and ht. treatment of gage, A (2) 28.
    a modern cycle, A (5) 96.
  Antaeus, P (8) 177.
  antimony oxide, color given to, A (11) 244.
  app. and method of producing charges of molten, P (4) 74.
  the application of self-luminous colored decorations in, A (3) 63.
  articles, app. for mfg. blown in mold, P (4) 74.
    molded from granules, process of, P (11) 249.
  basic silicates, indus., A (11) 246.
  batch, the mixing of, A (6) 123.
  batches, mixing of in factories, A (10) 219.
    use of lime or limestone in, A (5) 95.
  beads, decorated, A (5) 93.
  bending, app. for continuous sheet, P (7) 155.
  best ratio of cullet to batch, A (5) 93.
  blowing, mach., P (8) 177; P (10) 221.
    use of compressed air, A (4) 72.
  boiler gage prob., A (3) 62.
  boro-silicate, influence of boric oxide on annealing temp. of, A (12) 275.
    process for making, P (8) 178.
  bottle, sterilization, A (7) 152.
  bubbles, anal. of, A (8) 176; A (12) 276.
  calorizing, application of to processes, A (5) 96.
  carboy closure, the prob. of, A (6) 125.
  and ceram. ware, soly. and decompn. in complex systems, A (3) 59.
  chem. and hard glass, A (11) 247.
    resist., reln. between compn. and, A (12) 274.
  for chem. ware, P (3) 64.
  or china, metallic decorations on, P (6) 126.
  the chromate-albumin copying process as an etching basis for, A (2) 30.
  color given by tungsten, A (11) 242.
    given by vanadium, A (11) 243.
    imported by chromium, A (11) 243.
  coloring action of molybdenum on, A (11) 243.
    with nickel, A (3) 58.
  colorless, manuf. of in a tank fur., A (10) 218.
    production with ref. to selenium, A (5) 94.
    production of in tank fur., A (6) 124.
  columnar structure in sandstone tank blocks after rapid ht. and cooling, A (5) 94.
  composition, P (7) 155.
    contg. halogen compd., A (6) 126.
  containers app. for testing, P (2) 31.
    for nuts, A (2) 26.
  continuous annealing fur., P (3) 64.
    sheet leer conveyor for, P (7) 155.
  copper ruby, A (3) 62.
  crucible for mfg., P (2) 31.
  cutting mechanism, P (7) 153.
    while in plastic state, tool for, P (10) 219.
  cylinders method and app. for drawing, P (10) 220.
    method and app. for supporting, P (10) 220.
  dark spots in chromium green, A (2) 27.

d. of soda-lime-magnesia, calcn. of, A (10) 219.
devitrification caused upon surface by ht., A (6) 124.
diphasic nature of, A (11) 247.
discovery, A (2) 27.
dispersion formula and the secondary spectrum, A (2) 29.
drawing app., P (8) 178; P (8) 177.
sheets, P (11) 248.
durability of, a critical examn. of methods commonly employed, A (3) 60.
some aspects of the autoclave test for, A (12) 277.
effect of alumina in retarding devitrification of, A (6) 123.
of magnesia on resist. to corroding agents, A, (3) 61.
electrodeposition of silver and copper on, A (11) 246.
electrolytic migration of sodium through, A (4) 72.
embossed plate, mach. for constructing, P (11) 248.
etching, note on, A (5) 96.
examn. of by polarized light, A (3) 61.
extension of Zulkowski theory of reln. between compn. and durability, A (3) 61.
factory, chemist in, A (4) 73.
equipment, A (2) 31.
equipment, modern, A (5) 96.
old Pitkin, Manchester, Conn., preserved by D. A. R., A (8) 176.
feeding app., P (11) 250.
mech., P (12) 279.
molten, methods of, P (7) 154.
process of and app. for, P (8) 177.
finishing and polishing, P (11) 250.
flattening stones, A (11) 245.
flint d. 6.01 elec. properties of, A (9) 195.
fluorescence and coloration produced by β rays, A (8) 176.
for Ford windshields, A (5) 95.
formation, catalysis in, A (10) 217.
forming, process and app. for, P (11) 249.
mach., A (7) 152.
furnace, P (2) 31.
elec., A (8) 175.
feed trough for, P (10) 220.
for molten, P (6) 126.
new types in Eng. and Europe., A (12) 275.
tech. of, A (10) 217.
temps., A (6) 123.
furnaces contg. melting pots or crucibles, P (3) 64.
continuous, operg. with fuel oil, A (5) 95.
detecting stoppages in, by vacuum readings, A (4) 73.
recuperator for, P (4) 81.
gases evolved from known chem. compn., A (5) 96.
gold coating mixture for, P (8) 174.
grease for molds, A (2) 30.
grinding mach., P (4) 73; P (4) 74.
ht. insulating articles, manuf. of, P (11) 249.
hollow articles, P (3) 64.
panes process of making, P (8) 178.
house refrac., A (6) 129.
improvement in boro-silicate, P (3) 63.
industry, A (3) 58.
basis of progress in, A (10) 217.
British, its development and outlook, A (5) 93; A (10) 218.
British specif. in, A (12) 275.
in Ceylon, A (6) 123.
problems of the Ger., A (4) 73.
producer gas, a fuel for, A (3) 62.
progress in, A (9) 195.
influence of salt cake on decolorizing action of selenium, A (2) 27.
lamp bulbs, volume production of, A (10) 217.
lead, action of potassium carbonate on, A (11) 247.
leers ht. balance of, A (7) 153.
various types, A (5) 96.
of low coeff. of expansion, P (3) 64.
of low expansion, P (4) 73.
with low sp. gr., P (7) 155.
machinery, blowing, P (4) 74.
making in England, B (8) 179.
mach., lubrication of, A (12) 277.
sands (West Australia), A (7) 169.
manganese compds. as colorants, A (11) 243.
to selenium, A (5) 96.
manuf. in Burma, A (2) 27.
with the elec. radiation fur., A (5) 95.
ht. losses and their control, A (2) 29.
in India, A (4) 72.
steel for mold, A (7) 151.
use of halogen to modify color, P (12) 280.
medieval of York Minster, A (5) 94; A (10) 218.
melting of, A (2) 26; P (3) 64.
fur., P (6) 126.
prob. in, A (10) 218.
tank, P (11) 248.
and metal, contrast in manuf. of, A (5) 92.
joint, A (6) 125.
method and app. for flattening, P (7) 155.
milk bottles, a study of brown, A (3) 59.
a study of return and breakage prob., A (7) 152; A (8) 175.
mirror indus. (France), A (6) 123.
mirrors, chem. deposition of silver on, A (5) 93.
mold for, P (8) 179.
molds, P (3) 63.
matrix device for, P (7) 154.
molten, app. for gathering and transferring, P (7) 154.
app. for producing charges of, P (10) 220.
gathering and delivering app., P (11) 249.
method of and app. for feeding, P (10) 221.
natural and tech. constants of, A (2) 28.
necessity for preheating air in fur., A (2) 28.
neodymium oxide, use of to overcome yellow tint, P (8) 178.
non fragile, P (3) 63.
non shatterable, P (3) 64.
non shattering, A (6) 123.
optical, A (10) 217.
its properties and production, A (2) 28.
process of mfg., A (6) 123.
oven, manuf. and properties of, A (5) 95.
ovenware and holder therefore, P (8) 176.
paintings, processes and methods of medieval, A (6) 124.
plant of U. S. Sheet and Window Glass Co., Shreveport, La., A (3) 61.
plate, grinding and polishing of, A (10) 217.
polohalite, use of, A (2) 27.
pot, arches, treatise on design of, A (12) 275.
fur. door, P (12) 279.
fur. recuperative, improvement in design of, A (6) 123.
fur. temp. of, A (7) 151.
pots, cracking and corrosion, A (11) 245.

powder, A (2) 27.
pressed ring mold, P (7) 154.
Pyrex, A (1) 73; A (5) 92.
as material for chem. plant construction, A (5) 96.
quartz, A (7) 152.
elec. fur. for melting, A (11) 246.
raw mat. selection, A (4) 73.
reannealing of, A (3) 60.
refrac. mats., provisional specif. for, A (5) 91.
reheating of elec., A (7) 153.
reinforced, a new article of manuf., P (12) 277.
resist., manuf. of, P (12) 280.
resistant, procedure for making, A (12) 275.
resistivity of, A (7) 153.
for road bldg., A (2) 26.
ruby, A (2) 28.
salt cake *vs.* soda ash in soda lime glass, A (5) 93.
sand, anal. of, A (11) 246.
New Zealand, A (5) 92.
seedy during melting, A (12) 275.
sheet, app. for drawing, P (7) 154.
continuous drawing, P (12) 278.
cutting, app. for, P (7) 153.
drawing and delivering mechanism, P (12) 278.
drawing mechanism, P (11) 249; P (12) 277.
method and app. for continuous production, P (12) 279.
method and app. for drawing and flattening, P (12) 277.
method of making, P (12) 279.
methods of drawing, P (10) 220.
silica, P (11) 250.
its properties, history and manuf., A (4) 71.
transparent, P (7) 155.
silvering, A (7) 152.
Simpson continuous leer conveyor, A (6) 122.
soda-lime, action of water and steam on, A (11) 246.
spun app. for production, P (4) 74.
staining and etching, A (11) 245.
standard milk bottles, A (6) 123.
steel for mold for, P (7) 155.
strain in, some current views on detection A (12) 276.
study of exudation on at high temps., A (3) 58.
surfaces, the structure of abraded, A (2) 30.
to tarnish or etch, A (2) 28.
tank blocks, columnar structure in sandstone after rapid htg. and cooling, A (10) 218
fur. and air steam gas producer, ht. balance of plant, A (3) 59.
ht. balance for a 25 ton, A (3) 59.
tanks operg., life of, A (4) 73.
testing smalt blue, A (2) 5.
thermal expansion of soda-lead, A (11) 244.
thermo-resistant, P (11) 248.
tile for covering walls, P (8) 176.
training school opportunity for an American, A (7) 153.
transferring molten, means of, P (8) 178.
tubes, accurate by the Küpper process, A (9) 195.
tubing, clouding of table working in blowpipe flame, A (3) 59.
unbreakable, in Czecho-Slovakia, A (4) 72.
vessels, continuous cooling fur. for, P (6) 126.
viscosity of, effect of various constituents on, near its annealing temps., A (12) 276.
walls, rubbing of with glass rods, A (2) 28.
ware, manuf. of new, fur. for, P (12) 279.
watch crystals, manuf. of, A (5) 95.
white flint, manuf. of in a tank fur., A (6) 124.
window, a modern plant, A (10) 217.
wire, app. for making, P (12) 277.
wool, production, A (12) 274.
work opern., graphic check on, A (11) 246.
Glasses, anomalies in the expansion of, A (6) 125.
anti-glare, Sir William Crooks, historical, A (5) 96.
boro-silicate, a study of the melting and working properties of, A (12) 275.
chem. tests on, A (11) 245.
coloring with cobalt compds., A (7) 151.
conduction processes in ordinary soda-lime, A (5) 96.
detn. of sulphate, chloride and carbonate radicals in, A (11) 265.
diffusion of hydrogen and helium through silica and other, A (2) 14.
gage, testing of, A (3) 62.
ht. resisting, A (6) 125; A (7) 149; A (10) 218.
lime and magnesia, comparison of durability, A (3) 61.
optical process of mfg., P (3) 63.
Glassware annealing, an app. for controlling without pyrometers, A (3) 60.
autoclave test for, A (2) 27.
chem. action of various reagents on, A (3) 60.
cleaning compn. of matter for, P (8) 190.
criticism of use of autoclave in testing of, A (5) 92.
difficulties of interpretation of results, A (5) 92.
fire polishing of, A (4) 73.
lab. comparison of French, English, Ger. and Austrian, A (10) 217.
mechanism for conveying hot, P (8) 179.
pressed, mach. for making, P (8) 177.
table, decorating in colors, A (6) 122.
use of autoclave in testing of, A (5) 92.
fuel oil for finishing, A (5) 95.
Glauconite from the green sands near Lewes, A (3) 49.
Glaze, crystal with uranium, A (7) 142.
salt, stoneware, B (11) 259.
translucent hard faience, study of, A (7) 164.
vermilion with uranium, A (7) 142.
Glazed clay vessels, gilding of, A (8) 174.
ware, slip, A (8) 184.
Glazes, antimony yellow, A (5) 102.
blind, A (2) 21.
colored in the ceramic industry, A (8) 172.
uranium, A (7) 142.
white, for red burning clays, A (6) 126.
zircon for, A (7) 142.
Glazing bricks, A (6) 128.
Gold coating mixt. for glass or porcelain, P (8) 174.
Grading app. sieve, P (8) 190.
mat. separator for, P (8) 187.
of powders by elutriation, A (3) 47.
Graphite and amorphous carbon, nature of, A (5) 99.
Bavarian, A (5) 100.
crucible, P (7) 162, A (12) 282.
sepn. of by froth flotation method, A (4) 77.
some properties of, A (7) 161.
Gray iron melted elec., A (4) 79.
Grease for molds, A (2) 30.
Greek terra cottas, A (12) 272.
Grinding continuous, the Dorr Mill, A (6) 135.

importance of, A (2) 5.
mill, A (4) 77.
wheel dresser, P (9) 194.
test device, P (8) 172.
Gypsum, calcined, the hardening and the speed of soln., A (8) 189.
dispersoid chemistry of, A (2) 36.
energy of crystallization of calcium sulfate dihydrate, A (11) 239.
and gypsum products, tentative methods of testing, A (5) 90.
indus. definitions of terms relating to, A (5) 90.
plaster, hardened water-repellent, P (12) 274.
plastic, method for making, P (8) 189.
purification of, P (8) 184.
setting and velocity of soln. of burnt, A (6) 121.
tent. specif. for, A (5) 90.
withstands fire, A (2) 32.
Gyratory crushers, A (2) 33.

Hardening of calcined gypsum and the speed of soln., A (8) 189.
Hardness, of glass and crystal, proposed new scale for, A (11) 260.
tester, A (11) 260.
Health prob. of indus., A (8) 175.
Heat, action of on kaolins, clays, A (6) 138.
balance, of blast fur. and steel plants, A (3) 46.
gas producer, A (11) 246.
of glass leers, A (7) 153.
graphic method for computing, A (11) 268.
of a plant consisting of an air-steam blown gas producer and a glass tank fur., A (3) 59.
for a 25-ton glass tank, A (3) 59.
of combustion and work of dissociation, A (4) 79.
efficiency increase in cement burning, A (2) 35.
insulating mat., P (12) 289.
insulating mats. for elec. heated app., A (5) 104.
wares process of mfg , P (3) 55.
insulation, refrac., P (4) 76.
losses in fur., A (7) 169.
in glass manuf. and their control, A (2) 29.
resisting glasses, A (6) 125; A (10) 218.
Heavy clay, bldg. code for small houses, A (4) 74.
products, handling of, A (2) 24.
removal of limestone from clay, A (2) 26.
Helium and hydrogen, diffusion through silica and other glasses, A (2) 14.
Henley's Twentieth Century Formulas, recipes and processes, B (2) 41.
High temp. invest., A (9) 211.
meas., P (9) 204.
Historical sketch of the pottery indus., A (3) 45.
Hollow bldg. tile, tent. specif. for, A (5) 97.
block, shingle and wall construction, P (10) 222.
blocks and tile truck for, P (10) 222.
tile bldg. block, P (4) 75.
bldg. construction, P (9) 197.
and concrete floor slab reinforced in two directions, A (4) 75.
pilaster construction, P (7) 158.
tent. definition of terms relating to, A (5) 97.
wall construction, P (9) 197, P (12) 281.

Humidifying app. control, P (10) 227.
Humidity of air, app. for controlling, P (3) 48.
Hydraulic mining of silica, a marvel of mech. ingenuity, A (8) 175.
Hydrogen and helium diffusion through silica and other glasses, A (2) 14.
Hydrometer, P (3) 48.
a new form of, A (9) 201.

Igneous rock series, graphic study of, A (5) 107
phys. chemistry of the crystallization and magmatic differentiation of, A (5) 107.
Induction furnace, A (5) 100.
high temp. investigation, A (9) 211.
for melting non-ferrous metals, A (2) 20.
Wyatt, P (6) 132.
Inductive elec. fur., P (6) 135.
Insulating brick, highly porous A (12) 280.
cement, P (3) 53.
mat., ceram., P (6) 134.
mat. and processes, developments in Great Britain, A (3) 52.
Insulation, cement kiln, A (5) 101.
magnesia sheet for ht , P (3) 67.
Insulator connector, P (10) 226.
construction of, P (10) 226.
elec., P (8) 184.
equalization of strain on, P (9) 200.
line, P (12) 285.
Insulators, app. for shaping, P (11) 259.
Interlocking brick, P (4) 75; P (4) 76.
Iron, estn. of in ores and silicate rocks, A (11) 268
oxides, color of, A (2) 14.
scale and rust, removal of from iron and steel, P (12) 274.

Jogging mach. for molding plastic, fluid, powdered and the like, P (4) 78.
Joint for articles of ceram. mats., P (9) 200.

Kaolin, action of ht. on, A (6) 138.
Canadian, A (5) 106.
loss of water and its behavior toward carbonates and alkaline earths, A (11) 266.
in Mexico, A (11) 263.
relation to synthetic aluminum silicates, A (11) 267.
rept. on mining operations, A (12) 286.
Kaolin, Die physikalisch-technische Untersuchung Keramischer, B (7) 169.
Kaolinite, chem. relations at high temps., A (2) 13
Kaolins, clays, bauxites, loss on ignition and porosity of, A (4) 83.
countries producing, A (11) 264.
Keramik in Dienste von Industrie und Volkswirtschaft, B (10) 233.
Grundzüge, B (4) 87.
Keramite brick, A (8) 181
Kieselguhr in Chile, A (4) 81
mining, A (12) 280.
Kiln, P (11) 262
brick, P (7) 167.
method of setting and burning, P (8) 181
for burning brick, P (7) 167.
burning of downdraft, A (2) 3.
car tunnel, P (11) 262.
continuous, problems in burning Youngren, A (7) 166
removable top P (7) 168.
cylindrical, P (7) 167
decorating, a rapid firing fur. or kiln, P (8) 185.
fire box automatic, A (7) 158
for firing pottery, P (4) 81; P (11) 262.

furnace gas producer, comparison of coal consumption with hand fired, A (2) 5.
gas fired, P (7) 167.
Hoffmann continuous automatic feeding of fuel in, A (7) 166.
firing brick in, A (11) 251.
John Wright tunnel, A (6) 136.
pottery chamber, A (6) 137.
gas fired, P (3) 53.
roofing tile, P (3) 46.
rotary for htg. granular or pulverulent mat., P (6) 137.
for roasting bone black or fuller's earth, P (4) 81.
tunnel, P (4) 80.
car stopping device for, A (11) 262.
oil burner for, P (11) 263.
Kilns, annular, draft, resist. to and progression of the fire in, A (2) 7.
draft in, A (11) 261.
report by French Commission, A (4) 78.
some new forms of, A (3) 45.
thermometer for use in, P (2) 10.
tunnel, A (7) 166.
the firing and the ht. economy in, A (2) 4.
unloading, app. for, P (8) 179.
updraft burning in, A (5) 97.
use of hot air in continuous, A (2) 4.
whiteware, improvement of the firing procedure, A (11) 258.
Kinetic flocculation meters, A (2) 9.
Konimeter, notes on the evolution of, A (6) 135.
Küpper process, accurate glass tubes by, A (9) 195.

Laboratory Manual of Colloid Chemistry, B (2) 40.
Laterite dissociating, A (10) 214.
Leer, P (8) 176.
or annealing fur., P (7) 153.
conveyor for sheet glass, P (8) 179.
Simpson continuous conveyor, A (6) 122.
Leers, glass, various types of, A (5) 96.
ht. balance, A (7) 153.
Lime bricks, A (2) 32.
and cement, chem. reactions in the burning of, A (4) 71.
clays, working of, A (2) 26.
dissociation of clay by, A (2) 10.
ferric oxide and alumina sepd. from, A (5) 109.
free, in Port. cement clinker, A (11) 238.
fund. and chem. properties of commercial, A (2) 34.
hardening plaster or cement, P (7) 148.
kiln, continuous updraft vertical shaft, P (6) 121.
kilns, upright, A (11) 238.
or limestone in glass batches, A (5) 95.
and magnesia glasses, comparison of durability, A (3) 61.
mortars and cement, influence of hardening in steam under pressure, A (4) 71.
research, an untrodden field in, A (11) 239.
tent. methods of chem. anal. of limestone, quick and hydrated lime, A (5) 91.
specif. for the manuf. of sand lime brick, A (5) 91.
test on double burning, A (3) 65.
wet process of manuf., A (10) 216.
Limestone, dolomite and similar carbonate rock, charact. for the evaluation of, A (5) 91.
pebbles, removal of from clays, A (2) 26.
quarry, working of, A (3) 65.
Liparite, use of, in brick, P (7) 162.
Load test, detn. of softening temps. of refrac. under, A (3) 52.
Luster pottery, ancient and modern, A (6) 120.

Magmatic differentiation and crystallization of igneous rocks, the phys. chemistry of, A (5) 107.
Magnesia cement, caustic A (4) 70; A (5) 91.
effect of, on the resist. of glass to corroding agents, A (3) 61.
improvement in manuf. of, A (7) 148.
plaster, P (6) 122.
refrac., P (10) 226.
mat. for fur., P (6) 131.
sheet for ht. insulation, P (3) 67.
Magnesite caustic, calcined production of, in Scott fur., A (6) 121.
deposits of Grenville, Quebec, A (9) 209.
a new commercial refrac., A (7) 160.
production in Austria, A (12) 281.
rept. on the Manchurian, A (3) 52.
Magnesium chloride method of making, P (9) 206.
nitrate, process of producing, P (8) 189.
oxychloride cements, A (7) 147.
Malleable fur., bricks for, A (2) 18.
Manganese deposits, So. Africa, A (10) 229.
dioxide produced by chem. process in Calif., A (6) 139.
to selenium in glass, A (5) 96.
Marble-cement, P (3) 67.
Marl, Port. cement, made from, A (11) 239.
Masonry structure, P (7) 158.
Measurement of gas and liquids by orifice meter, B (5) 105.
Mechanical handling, A (2) 16.
Melting, elec. fur. for high temp., A (5) 100.
of glass, A (2) 26; P (3) 64.
point app., new form of, A (7) 165.
of potash feldspar, A (3) 61.
Mercury arc, a small high intensity, in quartz glass, A (5) 114.
Metallizing ceram. articles, P (8) 174.
Microcline feldspar, anal. of, A (2) 12.
Micropyrometer method for coal ash fusibility, A (6) 138.
Microscope, degree of firing detd. by, A (9) 210.
jointed, for lab. and workshop, A (2) 9.
super, and the Davon micro-telescope, A (5) 105.
use of, centesimal and rational analysis, A (8) 188.
Microscopic structure of common brick, A (11) 253.
study of cement clinker, reagents used in etching, A (7) 143.
Microscopical detn. of rock forming minerals and rocks, B (5) 108.
examn. of china clay, A (10) 226.
Mill, oversize return, P (8) 186.
Milling, ball and pebble, for pulverizing and mixing, A (2) 5.
tube, artificial pebbles for, A (2) 6.
Mills, conical, app. for entraining and removing fines, P (8) 186.
Mineral colors, A (2) 11.
pigments, A (2) 12.
Mineralogical methods, development of, A (8) 188.
Mineralogy, Dana's Text-book of, B (5) 108.
and petrology, the application of colloid chemistry to, A (5) 112.

Minerals, rock forming, essentials for the microscopical detn. of, B (5) 108.
Michell viscosimeter, A (5) 112.
Molding plastic, fluid, powdered and the like by jogging, P (4) 78.
sands, A (6) 130.
sands, factors influencing the grain and bond in, A (2) 7.
Molds, glass, P (3) 63.
Molybdenum coloring action on glass, A (11) 243.
resist. vacuum fur., A (5) 113.
Muffle fur., P (6) 137; P (10) 228.

Neodymium oxide, use of in boro-silicate glass to remove yellow tint, P (8) 178.
New Jersey's part in the ceram. history of America, A (8) 189.
Nickel, coloring glass with, A (3) 58.
salts, effect of on color, A (8) 183.
Nonslip quartz tile, P (8) 172.
tile, P (9) 200.

Oil burner, P (9) 202; P (9) 208; P (9) 209.
for tunnel kiln, P (11) 263.
Oil fired tilting crucible fur., P (6) 132.
fuel for clay drying, A (9) 211.
shale, A (4) 81.
retort, P (9) 212.
Opal, casing of, on flint glass, A (2) 26.
Optical glass, A (10) 217.
process of mfg., P (3) 63; A (6) 123.
its properties and production, A (2) 28.
Optical mineralogy, elements of, B (5) 108.
pyrometer, A (9) 202; A (11) 259.
pyrometry, personal equation errors, A (6) 135.
Ore roasting fur., P (9) 211.
Ores, app. and method for sampling, P (8) 190.
Orifice meter, meas. of gas and liquids by, B (5) 105.
Ornamented ware, P (12) 272.
Oxides, refrac., phys. chemistry of, A (9) 199.
Oxychloride cement, P (3) 67.
cement, refrac., P (3) 53.

Pennsylvania's resources, Smithsonian Institution's study of, B (5) 108.
Petrographic microscope, use of, in ceram. to exam. clay in raw and fired state, A (10) 221.
Petroleum, firing pottery kiln with, A (4) 79.
Phosphates in Morocco, A (7) 169.
Photoelastic observations showing diphasic nature of glass, A (11) 247.
Photomicrography, app. for, A (7) 165.
Physical chemistry of refractory articles, A (9) 199.
properties of clay, A (5) 110.
of porcelain, A (2) 22.
Physics in the ceram. indus., A (8) 187.
Pickling bath for iron, P (11) 242.
Pigments, mineral, A (2) 12.
pottery, P (2) 23.
Pilaster construction, P (7) 158.
Pistons, light metal for, A (3) 50.
Planer, shale, P (8) 187.
Plaster drying in humid air, A (10) 214.
of Paris, process of mfg., P (3) 67.
tech., A (11) 236.
wall board, P (6) 122.
Plastic clays, effect of electrolytes on, A (5) 108.
Plasticity of ceram. mats., A (9) 210.
of clays, test of, A (5) 110.
Plastometer as an instrument for process control, A (3) 50.
Polarized light, examn. of glass by, A (3) 61.
Polohalite, A (2) 27.
Porcelain bells in Ger., A (4) 84.
with beryl, P (10) 226.
burning of, A (4) 76.
with fuel oil, A (12) 283.
changes in phys. properties of, caused by varying Na to K feldspar and burning ht. treatment, A (5) 102.
Chelsea, B (4) 84.
chem., A (6) 133; A (11) 258.
crucible, P (6) 134.
elec., A (2) 23.
with beryl, P (3) 55.
insulation (III), A (11) 258.
modern handling methods in manuf. of, A (3) 55.
production of, A (9) 199.
some notes on, A (8) 184.
expts. on low temp., firing of, A (11) 258.
gold coating mixt. for, P (8) 174.
having appearance of granite, P (8) 184.
impervious, united by vitrification with porous alundum, P (7) 162.
influence of compn. upon properties of, A (2) 21.
insulator, app. for shaping, P (11) 259.
joint for ceram. articles and methods of producing same, P (4) 77.
manuf. in Indo-China, A (6) 134.
phys. properties of, A (2) 22.
pure white hard, expts. on manuf. of, A (7), 163.
spark plug compn., P (3) 55.
talc, P (9) 199.
tank and process of making the same, P (9) 200.
use of beryl, P (3) 51.
Porcelains, comparative examn. of, structure of Japanese and foreign, A (7) 162.
process of mfg. ignition plug and other, P (3) 55.
Porosity of kaolins, clays, banxites, etc., A (4) 83.
Portland cements, defects in manuf. of, A (2) 35.
Pot arches, treatise on design of, A (12) 275.
clays, provisional specif. for, A (5) 94.
fur., improvements in the design of recuperative, A (6) 123.
fur., temp. in, A (7) 151.
Potash basin of Alsatian, formation of, A (6) 137.
from feldspar, a new process for, A (2) 11.
glass, testing smalt blue, A (2) 5.
indus., French, A (9) 210.
rapid detn. of, in acid-insol. silicates, A (7) 169.
soda content of, a simple method for the estn. of, A (2) 13.
Potassium carbonate, action of, on lead glass, A (11) 247.
Potentiometer, pyrometer, P (6) 136.
Pottery architectural, process of mfg. rough surfaced, P (3) 57.
body, note on cause of splitting, A (3) 54.
drying ovens, efficiency of various types, A (6) 133.
forming machine, P (12) 285.
indus. art, and its application to the, A (6) 120.
in China, scien. aspects of, A (6) 134.

historical sketch of, A (3) 45.
pyrometer applied to, A (6) 133.
kiln for, P (4) 81.
chamber, A (6) 137.
firing with petroleum, A (4) 79.
luster, ancient and modern, A (6) 120.
mach. for use in manuf. of, P (11) 259.
making in the blue Nile, A (3) 54.
ornamented, manuf. of, P (12) 272.
pigments, P (2) 23.
plant design, Cresent China Co., A (5) 98.
romance of, A (7) 142.
shops, atmospheric conditions in, A (6) 133.
tool for decorating, P (8) 184.
Powdered coal firing, recent developments of, A (5) 116.
as fuel in steam plants, A (5) 116.
fuels, the dangers of, A (3) 45.
Precious stones, artificial, A (2) 6.
synthetic, A (9) 211.
Preheating air for small fur. with water gas and with coal, A (4) 79.
Press, ceram., P (4) 78.
for forming briquettes, P (8) 186.
Pressure exerted in a press, method and app. for measg., A (7) 165.
Prochlorites of the corundum bearing rocks, A (10) 225.
Producer gas, clean, A (10) 228.
estimation of hydrogen in, A (12) 287.
as fuel for the glass indus., A (3) 62.
fur., A (2) 5.
Properties of some ball clays, A (2) 24.
Pulverizing, ball and pebble, milling, A (2) 5.
mill, P (9) 204; P (9) 212; P (12) 286.
Purification of clay, A (2) 11.
Pycnometer, new precision, A (11) 260.
Pyrex glass, A (4) 73; A (5) 92.
as a mat. for chem. plant construction, A (5) 96.
Pyrometer, app. for controlling annealing of glassware without, A (3) 60.
optical, A (9) 202; A (11) 259.
of the potentiometer type, P (6) 136.
Pyrometers as applied to pottery indus., A (6) 133.
radiation modern, A (2) 9.
Pyrometry, optical, personal equation errors, A (6) 135.

Quarry blasting, A (10) 229.
Quartz glass, A (7) 152.
glass, a small intensity mercury arc in, A (5) 114.
influence of fluxes on transformation of, A (11) 267.
refrac., A (6) 128.
sealing of elec. conductors in, P (3) 63.
Quebec, china clay in, A (2) 12.

Rabble-fur. construction, P (11) 260.
Radiation meas., a thermoelement for, A (9) 202.
pyrometers, A (2) 9.
Radiophragm htg. surface combustion, A (9) 208.
Recorder, carbon dioxide, A (2) 7.
Recuperator for glass fur. and the like, P (4) 81.
Reduction of oxides of metals of the chromium group, A (8) 189.
Refining clay, P (3) 51.
Refractive indices of liquids, a simple instrument for testing, A (2) 9.
Refractometer for detn. of solid and liquid subs., A (2) 8.
Refractory, alumina, P (6) 132.
article, organic binder, P (8) 182.
articles, contg. zircon, P (6) 132.
Bavarian graphite, A (5) 100.
calcined magnesite, A (7) 160.
carbon, impregnated brick, A (12) 282.
carbonaceous, for fur. walls, P (6) 132.
carbonized brick, A (8) 182.
cement, A (11) 254.
aluminous, A (5) 91.
cements, A (2) 20
ceram. ware, silica carbide, P (6) 132.
compn., P (10) 226.
of natural or artificial corundum, P (3) 55.
with silicon carbide, P (3) 53.
cupola lining, A (5) 100.
crucibles, P (3) 53.
fire arch, P (12) 282.
fire brick disintegration, A (10) 223.
fur. lining, P (12) 282.
glass mats. provisional specif. for, A (5) 94.
ht. insulation, P (4) 76.
Keramite brick, A (8) 181.
linings, slag action on A (6) 131.
magnesia, P (10) 226.
material, carbonized clay, A (5) 101.
for fur., P (6) 131.
for high temp. fur., P (6) 132.
a new, A (12) 282.
for zinc retorts, P (3) 53.
materials, A (7) 161.
materials, for crucibles of bauxite and bentonite, P (6) 132.
for fur. and ovens, A (3) 51.
prepd. with sulfite pitch, P (6) 132.
mortar, requirements of, A (11) 256.
oxides, phys. chemistry of, A (9) 199.
oxychloride cement, P (3) 53.
porcelain, process of mfg., P (3) 55.
products, process for making, P (7) 162.
rammed linings replace brick, A (8) 181.
self-hardening, P (8) 182.
shapes, dry pressing of, A (5) 99.
silica mat. of S. Wales, A (11) 255.
silicon carbide, bonding with ceram. mat., P (6) 131.
softening under load, a new tester, A (10) 223.
super, laminated article, P (8) 183.
Refractories, Blue Mountain, A (9) 198.
brick for forges and annealing fur., A (3) 56.
carbon brick, A (2) 17.
coeff. of expansion of, A (7) 159.
coke oven walls, construction A, (2) 18.
destruction of, A (9) 198.
detn. of softening temp. under load, A (3) 52.
durability of, A (6) 129.
for elec. fur., A (3) 52.
elec. resistivity at high temp., A (2) 18.
expansion of silica brick in coke ovens, A (2) 16.
fire clay, A (2) 15.
glass house, A (6) 129.
jointing mat. for, A (11) 255.
limitations of in elec. fur., A (3) 51.
for malleable fur., A (2) 18.
manuf. of fire clay, A (2) 15.
porous, P (3) 53.
progress in, hastened by elec. fur. development, A (3) 52.

properties and testing, A (11) 256.
quartz, A (6) 128.
recent developments, A (2) 15.
a review, A (4) 76.
Siemens fur. practice, A (2) 16.
silica brick, P (3) 53.
bricks, modulus of rupture, hot and cold, A (9) 199.
slagging test, tent. method for, A (5) 99.
spalling action, tent. test for, A (5) 98.
a study of, A (3) 52.
thermal capacity of bricks, A (9) 197.
condy., A (2) 15.
properties of, at high temps., A (7) 159.
under load at high temps., A (2) 16.
use of in gas works, A (9) 199.
zirconia oxide articles, P (3) 53.
Research agencies, federal and state, A (3) 46.
bureau lab., Standard Steel Car Co., A (5) 115.
earning power of, as demonstrated by experience of American Rolling Mill Co., A (5) 117.
for engineering societies, A (3) 46.
the importance of, in development of ceram. indus. of N. A., A (2) 5.
institute, Ger., for slag cement, A (6) 121.
lab. of Imperial Iron Works, rept. of, on refrac., A (7) 159.
stimulating, by organization, A (3) 46.
Resin, aqueous soln. of a resin, for deflocculating clay, P (8) 190.
from British Columbia, a fossil, A (5) 105.
Resistivity of vitreous mat, A (7) 153.
Resistor supporting means, P (9) 208.
Reverberatory fur., P (4) 81.
Rocks, chem. anal., B (5) 114.
and their origins, B (5) 108.
Roofing tile, burning, A (3) 56.
indus., Ishikawa prefecture, A (11) 257.
kiln, P (3) 46.
scumming on, A (9) 195.
tiles, an unusual experience with, A (8) 183.
Rotary kiln for roasting bone black of fuller's earth, P (4) 81.
Rosin, tar and turpentine, A (5) 105.
Ruby glass, A (2) 28.
Rust, removal from metals, P (11) 242.

Sagger investigation, A (5) 104.
Saggers, holes bored to save fuel, P (7) 165.
Salt cake *vs.* soda ash in soda lime glasses, A (5) 93.
glaze stoneware, B (11) 259.
glazing brick, A (6) 127.
a curious defect in, A (5) 98.
Sampling ores, app. and method, P (8) 190.
Sand, glass, New Zealand, A (5) 92.
lime brick, A (12) 280.
brick, manuf. of, A (2) 26.
brick, tent. specif. for quick and hydrated lime for, A (5) 91.
bricks, A (2) 33.
Sands, molding, A (6) 130.
Saskatchewan, ceram. work at Univ., A (12) 289.
clays, A (4) 82.
clays and new indus., A (10) 229.
Scientists' reference book and diary, B (5) 117.
Scleroscope, P (6) 136.
Screen, high frequency, P (9) 204.
Scum due to vanadium in clay, A (3) 57.
Scum, stain, efflorescence on ceram. products, A (12) 288.
Scumming on roofing tile, A (9) 195.
Selenium, decolorizing a soda lime glass in tank fur., A (6) 124.
influence of salt cake on decolorizing action of, A (2) 27.
to manganese in glass, A (5) 96.
production of colorless glass in tank fur., A (5) 94.
Separating granular solid mat., P (9) 204.
solid mat. of different sp. gr., P (9) 204.
Separator, P (8) 187.
air, P (9) 206.
Sewer pipe, clay and cement, data on tests of, A (5) 98.
tent. specif. for, A (5) 97.
for required safe crushing strength of, A (5) 97.
Shale, app. for the combined solvent and destructive distillation treatment of, P (8) 190.
bituminous, burning, A (6) 127.
planer, P (8) 187.
a new way to use, A (7) 157.
process for treating, P (9) 212.
Shivering of terra cotta, notes on, A (2) 21.
Siemens fur. practice, A (2) 16.
Sieve centrifugal, A (3) 48.
Sifting testing mach., P (8) 185.
Silica acid sols, an invest. of the elec. properties of, A (3) 50.
brick, P (3) 53.
copper impregnated, A (7) 161.
expansion of, in coke ovens, A (2) 16.
smelting with reverberatory slags in copper blast fur., A (7) 161.
specif. for in glass, A (5) 94
bricks, modulus of rupture, hot and cold A (9) 199.
Canada, A (10) 230.
deposits, Sweden, A (11) 251.
fusing, methods of commercial electrothermic process, A (5) 117.
glass, A (7) 152; P (11) 250.
its properties, history and manuf., A (4) 71.
hydraulic mining of, A (8) 175.
Silicate of soda, a bibliography, B (7) 170.
Silicates, anal., phys. chemistry of thermodecompn., A (12) 287.
chem. constitution of, A (2) 13.
constitution of, A (9) 210.
of strontium and barium, A (4) 83
Siliceous, alumina compds., decompn. by, P (12) 288.
Silicon, amorphous and cryst. identity of, A (5) 113.
carbide, bonding with ceram mat., P (6) 131.
in an elec. resist mat., P (3) 53.
refrac. compn., P (3) 53.
refrac. ware, P (6) 132.
Sillimanite in spark plug porcelain, P (3) 55.
Silver, chem. deposition on mirrors, A (5) 93.
Silvering of glass, A (7) 152
Slag action on refrac. linings, A (6) 131
cement, Ger. research institute for, A (6) 121.
and dolomite cement, A (7) 111.
ferro manganese, bldg. block, P (11) 240.
Slagging action of refrac. mat., tent test for, A (5) 99.
Slags and cement, the remelting of, A (3) 65.
Slip glazed ware, A (8) 181
Slump test for concrete, A (9) 194.
Smelters, something better for enamels, A (3) 64.

Smoke, cause and prevention of, in boiler house, A (2) 4.
Soda ash *vs.* salt cake in soda lime glasses, A (5) 93.
content of a potash, a simple method for the estn. of, A (2) 13.
lime glasses, conduction process in, A (5) 96.
Sodium fluoride, manuf. of P (11) 265.
migration of, through glass, A (4) 72.
selenite, decolorizer of soda lime glass in tank fur., A (6) 124.
Sodium-silico fluoride, process of making, P (8) 189.
Solubility and decompn. in complex systems, glass and ceramic ware, A (3) 50.
Solvay, Ernest, an appreciation, A (3) 46.
Spalling action, tent. method of test for, A (5) 98.
Spark plug insulation, P (4) 77.
Specific ht. of gases, A (2) 14.
ht. during melting and ht. of fusion of some metals, A (2) 12.
Specification, hollow tile, A (5) 97.
sewer pipe, required safe crushing strength of, A (5) 97.
sewer pipe, tent., A (5) 97.
Specifications, brick, A (7) 156.
for bldg. and sand lime brick in Austria, A (11) 252.
in Brit. glass indus., A (12) 275.
coal purchase, rational basis for, A (6) 139.
for glass refrac. mat., A (5) 94.
government, for all types of brick work, A (10) 222.
for gypsum, A (5) 90.
Splitting of pottery body, note on cause of, A (3) 54.
Sulfite pitch, use of in refrac., P (6) 132.
Sulfur compds., effect of, on cement, A (3) 65.
Standard milk bottles, A (6) 123.
Standardization of barytes, A (5) 110.
of filter presses, A (3) 54.
Steam generator, elec., A (5) 115.
plants, powdered coal as fuel in, A (5) 116.
Stones, artificial, manuf. of, P (12) 273.
method of making ware of, P (3) 55.
Stones, method of making ware of, P (3) 55.
Stoneware, acid and chem. proof, A (10) 226.
chem., unique development of, modern, A (3) 54.
for construction mat., A (11) 259.
mathematical consideration of properties, A (11) 259.
Stratton, Samuel Wesley, A (3) 46.
Strontium and barium, silicates of, A (4) 83.
minerals, A (5) 105.
Surface combustion with special ref. to recent developments in radiophragm htg., A (9) 208.
and interfacial tension, film method for measg., A (5) 112.
tension, influence of, on melting and freezing, A (11) 267.
tension in solids, A (5) 111.
Swelling of sand upon absorption of moisture, A (6) 139.
Synthetic aluminium silicate and its reln. to kaolin, A (11) 267.

Talc porcelain, P (9) 199.
Tank blocks, columnar structure in sandstone after rapid htg. and cooling, A (10) 218.
provisional specif. for, A (5) 94.
sandstone, columnar structure in, after rapid htg. and cooling, A (5) 94.
Tanks, operg. life of, A (4) 73.
Tantalum, its tech. uses, A (9) 210.
Telescoping electrode protector, P (9) 205.
Temperature regulator, a new type of automatic, and its application to ht. treating fur., A (3) 48.
Temperatures, high, app. for measg., A (2) 9.
meas. of, in rotary cement kilns, A (2) 35.
Terra cotta, notes on shivering of, A (2) 21.
Sigillata, an introduction to the study of, B (2) 40.
Terra cottas, Greek, A (12) 272.
Test, absorption of common brick, A (3) 55.
action of various reagents on chem. glassware, A (3) 60.
autoclave for chem. glassware, A (2) 27.
for durability of glass, A (12) 277.
ball app. for resiliency, P (6) 136.
grinding wheel, device for, P (8) 172.
of a hollow-tile and concrete floor slab reinforced in two directions, A (4) 75.
modulus of rupture of silica brick, hot and cold, A (9) 199.
of molding sand, A (6) 130.
powdered barytes, A (5) 110.
slagging action of refrac. mat., tent. test for, A (5) 99.
slump for concrete, A (9) 194.
spalling action, tent. test for, A (5) 98.
Tester, hardness, A (11) 260.
refrac. load, A (10) 223.
Testing abrasives, app. for, P (6) 136.
app. for glass containers, P (2) 31.
elec. resistivity at high temps., A (2) 18.
gage glasses, A (3) 62.
glassware, criticism in use of autoclave, A (5) 92.
use of autoclave method in, A (5) 92.
hardness, elastic column dynamometer for, A (6) 135.
mach., suggested methods for verification of, A (5) 105.
mats., Franco-Belgian Assn. for, A (12) 273.
refractive indices of liquids, a simple instrument for, A (2) 9.
refrac. under load at high temps., A (2) 16.
sifting mach., P (8) 185.
smalt blue, A (2) 5.
tent. methods, for gypsum and gypsum products, A (5) 90.
of trass, A (2) 36.
Tests, ball clays, American and English, A (5) 101.
of chem. glasses, A (11) 245.
clay and cement tubing, A (5) 98.
clay, rational anal., and use of microscope, A (8) 188.
to det. uses for clay, A (3) 44.
on the double burning of lime, A (3) 65.
durability of glass,a critical examn. of methods commonly employed, A (3) 60.
gases evolved from glasses of known chem. compn., A (5) 96.
ht. insulating mat., A (5) 104.
phys. properties of hard porcelain caused by sodium and potash feldspar under varying burning temps., A (5) 102.
softening temp. of refrac. under load, A (3) 52.
surface tension, measg. by film method, A (5) 112.

Texture brick, method of forming, P (10) 222.
Thermal capacity of bricks, A (9) 197.
conductivity of fire clay refrac., A (2) 15.
of liquids, insulators and metals, meas. of, A (2) 8.
simple app. for comparing that of metals and thin specimens of poor conductors, A (5) 113.
of white marble and neat cement, A (2) 35.
endurance formula for, A (7) 149.
ht. resisting glasses, A (7) 149.
expansion of soda-lead glass, A (11) 244.
properties of refrac. at high temps., A (7) 159.
units, chart for, A (5) 111.
Thermochemistry of cement vertical kilns, A (2) 33.
new data on, A (11) 268.
Thermoelec. processes, A (2) 19.
Thermometer for use in kilns, P (2) 10.
Thermometers, stand. spec. for lab., B (5) 105.
Thermo-resistant glass, P (11) 248.
Thermostat, P (2) 10.
elec. htg. and controlling app. for, A (2) 7.
a new thermo-regulator for, A (2) 8.
Tile, ceram. safety-tread, P (6) 134.
glass for covering walls, P (8) 176.
making, modern, A (11) 253.
nonslip, P (9) 200.
quartz, P (8) 172.
press, power, P (9) 203.
safety tread, P (6) 120.
Tiles, flat roofing, unusual experience with, A (8) 183.
Tiling block, P (4) 76.
Titanic anhydride, to control resist. of aluminous abrasive grains to fracture, P (12) 272.
Titanium, A (9) 209.
Treatment of clay, deflocculation with aqueous soln. of a resin, P (8) 190.
Tube milling, artificial pebbles for, A (2) 6.
Tungsten, color given to glass, A (11) 242.
Tunnel kiln and drier, car stopping device for, A (11) 262.
kilns, A (7) 166.
firing and the ht. economy of, A (2) 4.
Transformation of quartz, influence of fluxes on, A (11) 267.
Transmission of ht. effect of enamel on, A (11) 242.
Trass, increasing resist. of cement to sea water by the addn. of, A (2) 36.
testing of, A (2) 36.
Treating clay, P (3) 51.
Twelve-hour shift, A (2) 5.

Under glaze coloring, process of, P (3) 55.
Uranium, effect of, upon the fusibility of Zettlitzer kaolin, A (5) 110.
glazes, A (7) 112.
protoxide in Czecho-Slovakia, A (6) 120.

Vacuum drying plant, A (4) 84.
fur. for high temps., A (9) 202.
new rotary mercury pump, A (3) 48.
simplest mercury vapor pump, A (3) 48.
Vanadium in ceram. raw mat. and ware and its effect on the fusibility and color and formation of scum, A (3) 57.
color given to glass, A (11) 243.
recovery of, from its ores, P (8) 188.
Vapor press. of the alkali fluorides, A (2) 13; A (4) 82.
of arsenic, A (9) 210.
and sublimation curves for some important metals, A (4) 82.
Vermilion glaze with uranium, A (7) 142.
Viscometer, pocket, A (11) 260.
Viscosimeter, P (2) 10; A (9) 201.
improved MacMichael, A (9) 201.
Michell, A (5) 112.
a new, A (8) 188.
for very viscous subs., A (6) 135.
Viscosity of glasses near its annealing temps., effect of various consts., A (12) 276.
meas., effect of variable heat in, A (5) 111.
the thickness of liquid films formed on solid surfaces under dynamic conditions, A (5) 113.
Volume change of Port. cement and of concrete, A (2) 36.
Vulcanizers or other app., controlling heating of, P (3) 48.

Wall construction, P (8) 180.
Wares of Ming Dynasty, B (17) 230.
Warpage of refrac. clays, kaolins and porcelain, A (10) 221.
Waste heat, utilization of, from rotary kilns, A (2) 36; A (3) 66.
Water glass—a bibliography, B (7) 170.
Waterproof tile, P (6) 121.
Waterproofing cement, A (6) 120.
hardening agent of cement, P (8) 175.
paint for cement, P (3) 67.
reagent for concrete, P (7) 149.
Weathering of Belgian bricks, A (2) 7.
Wedgewood Josiah, note books of, A (7) 142.
White flint glass, manuf. of, in a tank fur., A (6) 124.
Whiteware bodies, factory prepn., and burning of, A (2) 22.
crazing of English, A (6) 133.
kilns, improvement of the firing procedure, A (11) 258.
Whitewares casting, symp. on, A (12) 282.
Witherite and barytes, A (5) 105.

Yellow etching compd., A (2) 23.
Yellow glazes, antimony, A (5) 103.

Zeolites and calcium aluminium silicate, A (9) 210.
the problem of the combination of water in, A (12) 287.
Zinc white, manuf. of, P (11) 265.
Zircon, refrac. articles contg., P (6) 132.
sepg. from undesired subs., P (8) 189.
for white glazes, A (7) 142.
Zirconia crucibles, P (3) 53.
Zirconium oxide articles, P (3) 53.
process for producing, P (8) 189.
pure, prepn. of, A (9) 198.
purification and anal. of, A (5) 111.
Zirkite ore, a preliminary study of, A (5) 111.
Zulkowski theory of relation between compn. and durability of glass, an extension of, A (3) 61.

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